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Sputtering of High-Temperature Superconductors: A Bibliography

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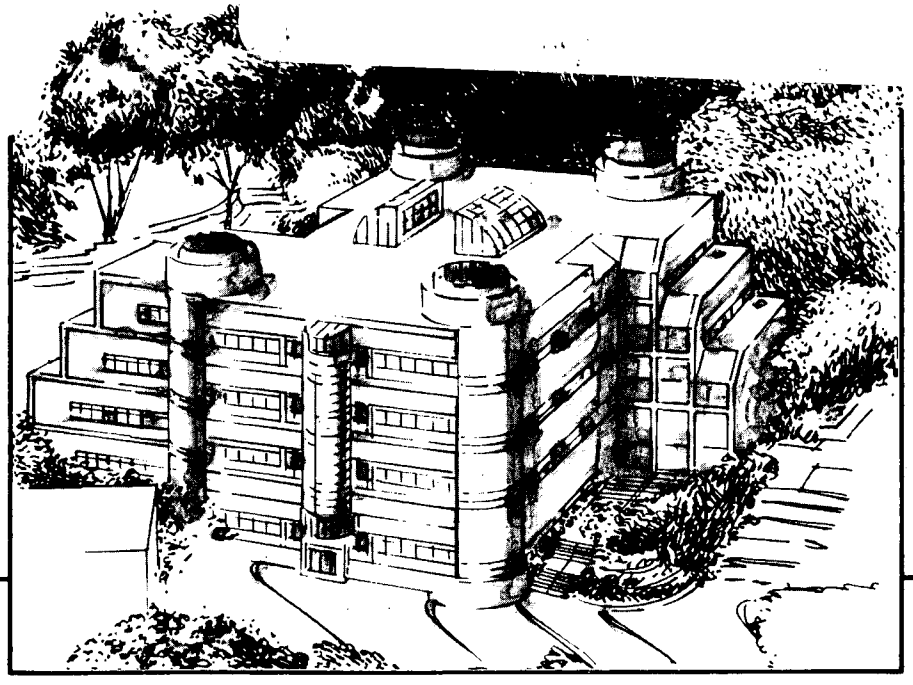

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SPUTTERING OF HIGH-TEMPERATURE SUPERCONDUCTORS: A BIBLIOGRAPHY*

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ABSTRACT

The literature on the sputtering of high-temperature superconducting cuprate thin films is presented. Much of the work is on $YBa_2Cu_3O_7$ and the related compounds with Y replaced by a +3 valence lanthanide. However, work on $(La_{1-x}Sr_x)_2CuO_4$ is included, as are the few available papers on films based on the Bi-Sr-Ca-Cu-O and Tl-Ca-Ba-Cu-O material systems. A listing of authors by institution shows which laboratories are currently most active in this field.

INTRODUCTION

In the new field of study of the high-temperature (>30K) superconductors, the publication rate is extremely high, but there are at present few review articles. (Notable exceptions are the introduction to the field by Geballe and Hulm,[1] and the review of small-scale analog applications by Clarke[2]). Good general introductions to low temperature superconductivity may be found in the texts by Kittel[3] and Tinkham.[4] No comprehensive reviews on sputtered films are yet available. The purpose of this bibliography is to assist researchers who wish to enter this burgeoning field, and to render assistance to those already investigating high-T_c sputtered films.

The references for this bibliography were compiled largely by the use of the INSPEC database produced by the Institution of Electrical Engineers. A few other bibliographical databases were consulted as well. Three conference proceedings not indexed by these sources were examined directly. Finally, relevant unpublished preprints which came to our attention were also included. A complementary reference is a bibliography by the National Technical Information Service (NTIS) on superconducting films covering the period 1975-1987.[5]

A bibliography of this nature will quickly become dated. Therefore, the reader will need to supplement the cited literature with additional, more recent papers. Conference proceedings are particularly valuable information sources; the Materials Research Society and American Vacuum Society meetings are examples. Other upcoming conferences are the Applied Superconductivity Conference, San Francisco, August 1988 and the Conference on the Science & Technology of Thin-Film Superconductors, Colorado Springs, Nov. 1988. A large percentage of the published papers on high-T_c thin films currently appears in *Applied Physics Letters* and the *Japanese Journal of Applied Physics, Letters*, so these journals are good for a "first look." Of course, new conferences and new journals are appearing, so these sources should be consulted as well.

The six sections of the main bibliography are organized according to material, with the older materials listed first:

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I. $(La_{1-x}Sr_x)_2CuO_4$
II. $YBa_2Cu_3O_7$ and $(La_{1-x}Sr_x)_2CuO_4$
III. $YBa_2Cu_3O_7$
IV. $YBa_2Cu_3O_7$ with substitutions for Y
V. Bi-Sr-Ca-Cu-O
VI. Tl-Ca-Ba-Cu-O

In the subsequent text, papers in the main bibliographical listing are referenced by the appropriate roman numeral, the first author's last name, and other identifying information as necessary. An example is (I, Adachi, June 1987).

COMMENTS ON THE LITERATURE

Sputtering is a common industrial and laboratory vacuum deposition process, in which a target is bombarded by ions (e.g. Ar). Target atoms are ejected and form a deposit on the substrate. Two standard references are the monograph by Chapman[6] and the handbook edited by Maissel and Glang.[7] Competing physical deposition processes are laser ablation,[8] e-beam evaporation,[9] and molecular beam epitaxy.[10] Chemical film synthesis techniques, which include sol-gel processing, chemical vapor deposition (CVD), and chemical beam epitaxy (CBE), are less developed at this writing, but may well assume increased importance in the future.

Most commonly, sputtered films have been fabricated by the use of a single stoichiometric target, or else by a target in which the cation composition is adjusted to compensate for preferential sputtering of one or more species. Other techniques include sputtering from several separate oxide targets (III, Char, Oct. 1987; III, Somekh), ion-beam sputtering (numerous papers), reactive sputtering using three metal targets (III, Char, Oct. 1987), and sputtering of metals followed by subsequent oxidation (III, Gurvitch, 2 papers). Targets may be monolithic solids or in powder form. It has been pointed out that BaF_2 is often a more useful source of Ba than the oxide or carbonate forms.[11] For example, the A.T.&T. group (III, Liou, in press) has successfully sputtered YBCO films using a single unreacted target of Y_2O_3, BaF_2, and CuO powders. Brief reviews which compare sputtering with other film synthesis techniques have been given by the Stanford and A.T.&T. groups (IV, Kapitulnik; III, Hong, Nov. 1987). A review of the literature on the preparation of $BaPb_{1-x}Bi_xO_3$ films (T_c=13K) was published in 1986,[12] just prior to the development of high-T_c films.

The sputtering atmosphere is often supplemented with oxygen to assist with incorporation of sufficient oxygen in the resulting film. The use of elevated substrate temperatures can also assist in the direct formation of the desired phase. However, if substrate temperatures or annealing temperatures are too high, interdiffusion of substrate and film takes place. In any case, films can be oxidized in a subsequent oxygen anneal.

The recent A.T.&T. work (III, Liou, in press) will be used to illustrate sputtering deposition parameters characteristic of the present state of the art for YBCO. A pure Ar atmosphere (6 mTorr) was used. Substrate-to-target distance was 5 cm; deposition rate was 0.1 nm/sec. An excess of Ba and deficit of Cu (relative to Y) was used in the target. Substrates employed were $SrTiO_3$, MgO, and Al_2O_3. The as-deposited films (insulating), were annealed in O_2 at 825 °C for 4-10 hours. The resulting films on single crystal $SrTiO_3$ substrates exhibited strong tendencies to be oriented epitaxially with the substrate.

Another illustration of deposition conditions for YBCO will be taken from the work of the group at Karlsruhe (III, Li; III, Meyer). The sputtering gas was 200 mTorr O_2 and 400 mTorr Ar. The substrate-to-target distance was 2-3 cm and the deposition rate was 5×10^{-4} nm/sec. The target was $YBa_2Cu_3O_7$. The (best) substrate temperature used was 770 °C; after deposition, no higher temperatures were required. A subsequent anneal at 430 °C in pure oxygen converted the films to the correct orthorhombic phase. These (and other) authors emphasize that bombardment of the growing film by negative oxygen ions must be minimized. Films grown by the Karlsruhe group have been superconducting above 77K even on Al_2O_3 substrates, due to the relatively low maximum temperatures used in

processing. Films on $SrTiO_3$ had a value of J_c of 1.3×10^6 A cm^{-2} at 77K.

Film quality can be determined by the standard characterization techniques for films (microscopy, x-ray diffraction, XPS, RBS, etc.), but electrical measurements are also essential. A sharp transition to the superconducting state, with T_c (onset) close to T_c(resistance = 0), is an indicator that the film is mostly a single superconducting phase. A high and metallic conductivity in the normal phase (resistance increases with increasing temperature) is further regarded as a measure of high sample quality. Finally, a high critical current density, J_c, with weak dependence on applied magnetic field, is desired.

Sputtering has produced some of the best high-T_c films to date. In particular, high critical current densities have been attained which far exceed those currently attainable with bulk polycrystalline materials. The group at NTT Electrical Communications Laboratories (III, Enomoto, July 1987) has achieved critical current densities of 1.8×10^6 A cm^{-2} at 77K in epitaxial films of $YBa_2Cu_3O_7$ on $SrTiO_3$ (110) substrates (current flow parallel to the copper oxide planes). The corresponding film resistivity just above T_c is about 3×10^{-4} ohm cm. The group at Sumitomo Electric Industries, Ltd. subsequently produced sputtered films of $HoBa_2Cu_3O_7$ on (001) MgO with values of J_c of 2.5×10^6 A cm^{-2} at 77K and 1.5×10^6 A cm^{-2} at 77K in a field of 1 Tesla (IV, Tanaka). Then Sumitomo increased J_c to over 3.0×10^6 A cm^{-2} by replacement of Ho by Er (IV, Itozaki, 2 papers).

PUBLICATION DEMOGRAPHICS

As is well known, the countries producing the most papers are the U. S. and Japan. Since we have surveyed only the English language literature, the Japanese contribution is all the more impressive. Soviet publications clearly are greatly underrepresented here, because they are published in Russian, and translation journals which are available introduce a delay of some months.

The distribution of the Japanese work over the various high-T_c materials is interesting. Of the 146 papers specifically on YBCO films (Section III), only 36 are by Japanese groups. However, 10 out of 13 papers on LSCO (Section I), 17 of 19 papers on lanthanide substituted YBCO (Section IV), and about half of the papers on Bi-Sr-Ca-Cu-O (Section V) were Japanese in origin. Thus, the Japanese effort is well-distributed over all the various important materials, whereas the effort in other countries is more strongly focused on YBCO.

The appended listing of authors' institutions is included to provide an informal directory of active researchers. The number of papers each institution has produced is listed as well. While the listing gives a good general idea which research centers have the most activity in high-T_c sputtering, one should keep in mind that there are a similar number of individuals who are working in the field but have not yet published.

Research institutions with 5 or more papers are, in the U. S.: Argonne National Laboratory, A.T.&T. Bell Laboratories, IBM Almaden Research Center, IBM Thomas J. Watson Research Center, Stanford University, and Westinghouse R&D Center; in Japan: Electrotechnical Laboratory, Kawatetsu Mining Co., Ltd., Matsushita Electric Industrial Co. Ltd., NEC Corporation, NTT Electrical Communications Laboratories, Sumitomo Electric Industries Ltd., and the University of Tokyo; elsewhere: the Chinese Academy of Sciences, Kernforschungszentrum Karlsruhe, and Phillips Research Laboratories.

The total number of papers in the bibliography is 206; the total number of authors is 620.

REFERENCES

1. Geballe, T.H. and Hulm, J.K., "Superconductivity—the state that came in from the cold," *Science* **239**, 367-375, 22 Jan. 1988.
2. Clarke, J., "Small-scale analog applications of high-transition-temperature superconductors," *Nature* **333**, 29-35, 5 May 1988.
3. Kittel, C., *Introduction to Solid State Physics,* 5th edition (Wiley, New York), Chapter 12, 1976.
4. Tinkham, M., *Introduction to Superconductivity* (McGraw-hill, New York), 1975.

5. National Technical Information Service (NTIS), "Thin superconducting films: sputtering, characterizations, and applications," Report No. PB-88-855507/XAB, 141 pages, Jan. 1988. Contains 302 citations from INSPEC covering the period Jan. 1975-Dec. 1987. Available from NTIS, Springfield VA.
6. Chapman, B., *Glow Discharge Processes* (McGraw-Hill, New York), 1980.
7. Maissel, L.I. and Glang, R. (Editors), *Handbook of Thin Film Technology* (McGraw-Hill, New York), 1970.
8. Kijkhamp, D., Venkatesan, T., Wu, X.D., Shaheen, S.A., Jisrawi, N., Min-Lee, Y.H., McLean, W.L., and Croft, M., *Appl. Phys. Lett.* **51**, 619-621, 1987.
9. Chaudhari, P. Koch, R.H., Laibowitz, R.B., McGuire, T.R., and Gambino, R.J., *Phys. Rev. Lett.* **58**, 2684-2687, 1987.
10. Webb, G., Weng, S.L., Eckstein, J.N., Missert,N., Char, K., Schlomn, D.G., Hellman, E.S., Beasley, M.R., Kapitulnik, A., and Harr, J.S., *Appl. Phys. Lett.*, in press.
11. Mankiewich, P.M., Scofield, J.H., Skocpol, W.J., Howard, R.E., Dayem, A.H., and Good, E., *Appl. Phys. Lett.* **51**, 1370-1372, 1987.
12. Suzuki, M., *Adv. Cryog. Eng.* **32**, 517-526, 1986.

BIBLIOGRAPHY OF SPUTTERED HIGH-T_c THIN FILMS

I. $(La_{1-x}Sr_x)_2CuO_4$ Thin Films

Adachi, H., Setsune, K., and Wasa, K., "Superconductivity in $(La_{0.9}Sr_{0.1})_2CuO_4$ single-crystal films," *Phys. Rev. B* **35** (16), 8824-8825, 1 June 1987.

Adachi, H., Setsune, K., and Wasa, K., "Superconductivity of La-Sr-Cu-O single-crystal thin films," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.2, 1139-1140, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

Edelstein, A.S., Qadri, S.B., Holtz, R.L., Broussard, P.R., Claassen, J.H., Francavilla, T.L., Gubser, D.U., Lubitz, P., Skelton, E.F., and Wolf, S.A., "Formation of the structure of the superconducting phase of La-Sr-Cu-O by DC sputtering," *J. Cryst. Growth* **85** (4), 619-622, Dec. 1987.

Geerk, J., Linker, G., Meyer, O., Politis, C., Ratzel, F., Smithey, R., Strehlau, B., and Xiong, G.C., "Thin film synthesis and the influence of irradiation-induced defects on the superconductivity of $La_{1.8}Sr_{0.2}CuO_4$," *Z. Phys. B* **67** (4), 507-511, 1987.

Kawasaki, M., Funabashi, M., Nagata, S., Fueki, K., and Koinuma, H., "Compositional and structural analyses for optimizing the preparation conditions of superconducting $(La_{1-x}Sr_x)_yCuO_{4-\delta}$ films by sputtering," *Jpn. J. Appl. Phys. 2* **26** (4), L388-L390, April 1987.

Koinuma, H., Kawasaki, M., Funabashi, M., Hasegawa,T., Kishio, K., Kitazawa, K., Fueki, K., and Nagata, S., "Preparation of superconducting thin films of $(La_{1-x}Sr_x)_yCuO_{4-\delta}$ by sputtering," *J. Appl. Phys.* **62** (4), 1524-1526, 15 Aug. 1987.

Li, L., Zhao, B., Lu, Y., Wang, H., Zhao, Y., and Shi, Y., "Superconductivity of Sr-La-Cu-O thin films," *Chin. Phys. Lett.* **4** (5), 233-236, 1987.

Moriwaki, K., Enomoto, Y., and Murakami, T., "I-V characteristics of $(La_{1-x}Sr_x)_2CuO_4$ superconducting films and infrared irradiation effects," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.2, 1147-1148, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

Moriwaki, K., Enomoto, Y., and Murakami, T., "Josephson junctions observed in $La_{1.8}Sr_{0.2}CuO_4$ superconducting polycrystalline-films," *Jpn. J. Appl. Phys. 2* **26** (4), L521-L523, April 1987.

Nagata, S., Kawasaki, M., Funabashi, M., Fueki, K., and Koinuma, H., "High T_c thin films of $(La_{1-x}M_x)_yCuO_{4-\delta}$ (M=Sr, Ba, Ca) prepared by sputtering," *Jpn. J. Appl. Phys. 2* **26** (4), L410-L412, April 1987.

Suzuki, M., Moriwaki, K., and Murakami, T., "Carrier density of superconducting $(La_{1-x}Sr_x)_2CuO_4$ single crystal thin films," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.2, 1103-1104, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

Suzuki, M., and Murakami, T., "Hall effect in superconducting $(La_{1-x}Sr_x)_2CuO_4$ single crystal thin films," *Jpn. J. Appl. Phys. 2* **26** (4), L524-L525, April 1987.

Terada, N., Ihara, H., Hirabayashi, M., Senzaki, K., Kimura, Y., Murata, K., and Tokumoto, M., "Deposition of $Sr_xLa_{2-x}CuO_{4-y}$ thin films by sputtering," *Jpn. J. Appl. Phys. 2* **26** (4), L508-L509, April 1987.

II. Both $YBa_2Cu_3O_7$ and $(La_{1-x}Sr_x)_2CuO_4$ Thin Films

Kobrin, P.H., DeNatale, J.F., Housley, R.M., Flintoff, J.F., and Harker, A.B., "Superconducting oxide thin films by ion beam sputtering," *Adv. Ceram. Mater.* **2** (3B), 430-435, July 1987.

Koinuma, H., Kawasaki, M., Hashimoto, T., Nagata, S., Kitazawa, K., Fueki, K., Masubuchi, K., and Kudo, M., "Some problems in the preparation of superconducting oxide films on ceramic substrates," *Jpn. J. Appl. Phys. 2* **26** (5), L763-L765, May 1987.

Madakson, P., Cuomo, J.J., Yee, D.S., Roy, R.A., and Scilla, G., "Processing of $La_{1.8}Sr_{0.2}CuO_4$ and $YBa_2Cu_3O_7$ superconducting thin films by dual-ion-beam sputtering," *J. Appl. Phys.* **63** (6), 2046-2053, 15 March 1988.

Moriwaki, K., Suzuki, M., Enomoto, Y., and Murakami, T, "Electrical properties of superconducting $(La_{1-x}Sr_x)_2CuO_4$ and $Ba_2YCu_3O_{7-\delta}$ thin films," *Extended Abstracts: High Temperature Superconductors*, Gubser, D.U. and Schluter, M. (Editors), Proceedings of Symposium S, 1987 Spring Meeting of the Materials Research Society, 85-7, 1987, 23-24 April 1987, Anaheim, CA, USA.

Osofsky, M., Toth, L.E., Lawrence, S., Qadri, S.B., Shih, A., Mueller, D., Hein, R.A., Fuller, W.W., Rachford, F.J., Skelton, E.F., Elam, T., Gubser, D.U., Wolf, S.A., Gotaas, J.A., Rhyne, J.J., Kurtz, R., and Stockbauer, R, "Experimental program on high T_c oxide superconductors at the Naval Research Laboratory," *Extended Abstracts: High Temperature Superconductors*, Gubser, D.U. and Schluter, M. (Editors), Proceedings of Symposium S, 1987 Spring Meeting of the Materials Research Society, 173-5, 1987, 23-24 April 1987, Anaheim, CA, USA.

Schindler, W., Grassmann, A., Schmitt, P., Stroebel, J., Niederhofer, H., Adrian, G., Saemann-Ischenko, G., and Adrian, H., "Preparation, structure, transport properties, and photoemission studies of the high-Tc superconductors yttrium barium copper oxide ($YBa_2Cu_3O_{4-\delta}$) and lanthanum strontium copper oxide ($La_{1-x}Sr_xCuO_4$)," *Jpn. J. Appl. Phys. Suppl.* **26-3**, Pt. 2, 1199-1200, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

Wang, H.S., Li, L., Zhao, B.R., Lu, Y., Shi, Y.H., Zhao, Y.Y., Yuan, C.W. , and Gao, J., "High T_c oxide superconducting thin films," *Mod. Phys. Lett. B* **1** (5-6), 265-269, 1987.

Zhao, B.R., Li, L., Lu, Y., Wang, H.S., Shi, Y.H., Zhao, Y.Y., Yuan, C.W., and Gao, J., "High T_c superconductivity of Sr-La-Cu-O and Ba-Y-Cu-O thin films," *Mod. Phys. Lett. B* **1** (4), 177-180, July 1987.

Zhao, B., Wang, H., Lu, Y., Shi, Y., Zhao, Y., and Li, L., "High T_c superconductivity of Sr-La-Cu-O and Ba-Y-Cu-O thin films," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.2, 1137-1138, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

III. $YBa_2Cu_3O_7$ Thin Films

Adachi, H., Setsune, K., Mitsuyu, T., Hirochi, K., Ichikawa, Y., Kamada, T., and Wasa, K., "Prepara-

tion and characterization of superconducting Y-Ba-Cu-O thin films," *Jpn. J. Appl. Phys. 2* **26** (5), L709-L710, May 1987.

Aida, T., Fukazawa, T., Takagi, K., and Miyauchi, K., "Preparation of $YBa_2Cu_3O_{7-x}$ superconducting thin films by RF-magnetron sputtering," *Jpn. J. Appl. Phys. 2* **26** (9), L1489-L1491, Sept. 1987.

Aizaki, N., Terashima, K., Fujita, J., and Matsui, S., "$YBa_2Cu_3O_y$ superconducting thin film obtained by laser annealing," *Jpn. J. Appl. Phys. 2* **27** (2), L231-L233, Feb. 1988.

Akinaga, M., Abukay, D., and Rinderer, L., "Superconducting fluctuation effect in $YBa_2Cu_3O_{7-\delta}$ films and A-15 films," *Physica C* **153-155**, 812-813, 1988.

Akoh, H., Shinoki, F., Takahashi, M., and Takada, S., "S-N-S Josephson junction consisting of Y-Ba-Cu-O/Au/Nb thin films," *Jpn. J. Appl. Phys. 2* **27** (4), L519-L521, April 1988.

Akoh, H., Shinoki, F., Takahashi, M., and Takada, S., "Thickness dependence of superconductivity in rf-sputtered Y-Ba-Cu-O thin films," *Appl. Phys. Lett.* **52** (20), 1732-1734, 16 May 1988.

Antonenko, S.V., Bezotosnyi, I.Yu., Grigor'ev, A.I., Degtyarenko, N.N., Evstigneev, V.V., Elesin, V.F., Zhuchkov, V.E., Zakharchenko, I.V., Molchanov, A.S., et al, "Effect of ion irradiation on the properties of oxide high-temperature superconductors," *JETP Lett.* **46** (9-10), 362-364, November 1987.

Argana, J., Rath, R.C., Kadin, A.M., and Ballentine, P.H., "RF sputter deposition of Y-Ba-Cu-O superconducting thin films from an oxide powder target," *AIP Conf. Proc.* **165**, 58-65, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Asano, H., Tanabe, K., Katoh, Y., Kubo, S., and Michikami, O., "High-T_c Y-Ba-Cu-O thin films prepared by dual magnetron sputtering," *Jpn. J. Appl. Phys. 2* **26** (7), L1221-L1222, July 1987.

Aslam, M., Soltis, R.E., Logothetis, E.M., Ager, R., Mikkor, M., Win, W., Chen, J.T., and Wenger, L.E., "Rapid thermal annealing of YBaCuO films on Si and SiO_2 substrates," *Appl. Phys. Lett.* **53** (2), 153-155, 11 July 1988.

Auciello, O. and Krauss, A.R., "Proof-of-principle of a novel method for sputter-deposition of high T_c superconductor films via a computer-controlled mass analyzed ion beam," *AIP Conf. Proc.* **165**, 114-121, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Ballentine, P.H., Kadin, A.M., Argana, J., and Rath, R.C., "Thin films of Y-Ba-Cu-O by RF sputtering," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 335-338, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Beasley, M.R., "Synthesis and properties of thin film high-T_c oxide superconductors," *Physica* **148B+C** (1-3), 191-195, Dec. 1987.

Blamire, M.G., Somekh, R.E., Morris, G.W., Tomlinson, E.J., and Evetts, J.E., "Preparation and properties of high T_c superconducting films and device structures," Commission of the European Communities *European Workshop on High T_c Superconductors and Potential Applications*, Proceedings,

129-30, 1987, 1-3 July 1987, Genova, Italy, Publ: Comm. Eur. Communities, Brussels, Belgium.

Bozovic, I., Char, K., Yoo, S.J.B., Kapitulnik, A., Beasley, M.R., Geballe, T.H., Wang, Z.Z., Hagen, S., Ong, N.P., Aspnes, D.E., and Kelly, M.K., "Optical anisotropy of $YBa_2Cu_3O_{7-x}$," *Phys. Rev. B*, in press. Department of Applied Physics, Stanford University, Stanford, CA 94305-4090, preprint.

Braginski, A.I., Talvacchio, J., Gavaler, J.R., Forrester, M.G., and Janocko, M.A., "In-situ fabrication, processing, and characterization of superconducting oxide films," *High-T_c Superconductivity: Thin Films and Devices*, SPIE Proceedings **948**, van Dover, R.B. and Chi, C.C. (Editors), 1988, in press, Publ: SPIE, Bellingham, WA. Westinghouse R&D Center, Pittsburgh, PA 15235, preprint.

Bruyere, J.C., Marcus, J., Reydet, P.L., Escribe-Filippini, C., and Schlenker, C., "High T_c superconducting $YBa_2Cu_3O_{7-x}$ thin films prepared by radio-frequency reactive sputtering," *Mater. Res. Bull.* **23** (34), 29-35, March 1988.

Buder, R., Boujida, M., Bruyere, J.C., Escribe-Filippini, C., Marcus, J., Reydet, P.L., and Schlenker, C., "Magnetic properties of $YBa_2Cu_3O_7$ superconducting thin films," *Physica C* **153-155**, 1441-1442, 1988.

Bullock, D.C., Rettner, C.T., Lee, V.Y., Lim, G., Savoy, R.J., and Auerbach, D.J., "Production of superconducting $Y_1Ba_2Cu_3O_x$ thin films by DC diode sputtering and annealing," *AIP Conf. Proc.* **165**, 71-78, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Burbidge, D.S., Dew, S.K., Sullivan, B.T., Fortier, N., Parsons, R.R., Mulhern, P.J., Carolan, J.F., and Chaklader, A., "DC magnetron sputtering of high T_c superconducting thin films," *Solid State Commun.* **64** (5), 749-751, Nov. 1987.

Burbidge, D.S., Mulhern, P., Dew, S., and Parsons, R., "Sputter deposition of Y-Ba-Cu-O compound system," *AIP Conf. Proc.* **165**, 87-94, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Carini, J., Awasthi, A., Beyermann, W., Gruner, G., Hylton, T., Char, K., Beasley, M.R., and Kapitulnik, A., "Millimeter-wave surface resistance measurements in highly oriented $YBa_2Cu_3O_{7-\delta}$ thin films," *Phys. Rev. B* **37** (16), 9726-9729, 1 June 1988.

Chaklader, A.C.D., Roemer, G., Hardy, W.N., Brewer, J.H., Carolan, J.F., and Parsons, R.R., "Studies on ceramic superconductors," *Adv. Ceram. Mater.* **2** (3B), 556-562, July 1987.

Char, K., Kent, A.D., Kapitulnik, A., Beasley, M.R., and Geballe, T.H., "Reactive magnetron sputtering of thin-film superconductor $YBa_2Cu_3O_{7-x}$," *Appl. Phys. Lett.* **51** (17), 1370-1372, 26 Oct. 1987.

Char, K., Lee, M., Barton, R.W., Marshall, A.F., Bozovic, I., Hammond, R.H., Beasley, M.R., Geballe, T.H., Kapitulnik, A., and Laderman, S.S., "Properties of Y-Ba-Cu-O thin films with ordered defect structure: $Y_2Ba_4Cu_8O_{20-x}$," *Phys. Rev. B* **38** (1), 834-837, 1 July 1988.

Chien, C.L., Xiao, G., Cieplak, M.Z., Bakhshai, A., Gavrin, A., Streitz, F.H., and Childress, J., "Fabrication of high T_c superconducting films with diffusion barriers," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 311-314, 1987 Fall Meeting of the Materials Research Society, 30

Nov.-4 Dec. 1987, Boston, MA, USA.

Chien, C.L., Xiao, G., Streitz, F.H., Gavrin, A., and Cieplak, M.Z., "Effect of noble metal buffer layers on superconducting $YBa_2Cu_3O_7$ thin films," *Appl. Phys. Lett.* **51** (25), 2155-2157, 21 Dec. 1987.

Cuomo, J.J., Chisholm, M.F., Yee, D.S., Mikalsen, D.J., Madakson, P.B., Roy, R.A., Giess, E., and Scilla, G., "Substrate effect on the superconductivity of $YBa_2Cu_3O_7$ thin films," *AIP Conf. Proc.* **165**, 141-148, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Dam, B., Baller, T.S., van Veen, G.N.A., van Hal, H.A.M., de Vries, J.W.C., and Stollman, G.M., "Interface effects of laser ablated and sputtered high T_c superconducting thin films," *High-Temperature Superconductors,* Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 303-306, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA.

Dam, B., van Hal, H.A.M., and Langereis, C., "Triode-sputtered high-T_c superconducting thin films," *Europhys. Lett.* **5** (54), 55-60, 1 March 1988.

Davidson, A., Palevski, A., Brady, M.J., Laibowitz, R.B., Koch, R., Scheuermann, M., and Chi, C.C. "In situ resistance of $Y_1Ba_2Cu_3O_x$ films during anneal," *Appl. Phys. Lett.* **52** (2), 157-159, 11 Jan 1988.

Derer, J., Illitova, G., Benacka, S., Koller, A., Skacel, V., Strbik, V., Smatko, V., and Schilder, J., "Y-Ba-Cu-O superconducting thin films prepared by RF magnetron sputtering," *Czech. J. Phys.* **B38** (2), 233-236, 1988.

de Vries, J.W.C., Dam, B., Heijman, M.G.J., Stollman, G.M., Gijs, M.A.M., Hagen, C.W., Griessen, R.P., "Preparation, patterning, and properties of thin $YBa_2Cu_3O_{7-\delta}$ films," *Appl. Phys. Lett.* **52** (22), 1904-1906, 30 May 1988.

de Vries, J.W.C., Gijs, M.A.M., and Stollman, G.M., "Critical current as a function of temperature in thin $YBa_2Cu_3O_{7-\delta}$ films," *Physica C* **153-155**, 1437-1438, 1988.

de Vries, J.W.C., Gijs, M.A.M., Stollman, G.M., Baller, T.S., and van Veen, G.N.A., "Critical current as a function of temperature in thin $YBa_2Cu_3O_{7-\delta}$ films," *J. Appl. Phys.* **64** (1), 426-429, 1 July 1988.

Enomoto, Y., Murakami, T., Suzuki, M., and Moriwaki, K., "Largely anisotropic superconducting critical current in epitaxially grown $Ba_2YCu_3O_{7-y}$ thin film," *Jpn. J. Appl. Phys. 2* **26** (7), L1248-L1250, July 1987.

Enomoto, Y., Suzuki, M., Oda, M., and Murakami, T., "Anisotropic properties of epitaxial $Ba_2YCu_3O_{7-y}$ thin films," *Physica* **148B+C** (1-3), 408-410, Dec. 1987.

Evetts, J.E., Somekh, R.E., Blamire, M.G., Barber, Z.H., Butler, K., James, J.H., Morris, G.W., Tomlinson, E.J., Schwarzenberger, A.P., and Stobbs, W.M., "Structural stability and kinetic processes in YBaCuO thin films and device structures," *Extended Abstracts: High Temperature Superconductors,* Gubser, D.U. and Schluter, M. (Editors), Proceedings of Symposium S, 1987 Spring Meeting of the Materials Research Society, 227-229, 1987, 23-24 April 1987, Anaheim, CA, USA.

Fujita, J., Yoshitake, T., Kamijo, A., Satoh, T., and Igarashi, H., "As-grown a- and c-axis oriented epi-

taxial BYCO films prepared by IBS method," *Extended Abstracts: High-Temperature Superconductors II*, Capone, D.W., Butler, W.H., Batlogg, B., and Chu, C.W. (Editors), 109-112, 1988, Materials Research Society Symposium Proceedings, 5-9 April 1988, Reno, NV, USA.

Fujita, J., Yoshitake, T., Kamijo, A., Satoh, T., and Igarashi, H., "Preferentially oriented epitaxial Y-Ba-Cu-O films prepared by the IBS method," Fundamental Research Laboratories, NEC Corporation, 4-1-1 Miyazaki Miyamae-ku, Kawasaki 213, JAPAN, preprint.

Gavaler, J.R. and Braginski, A.I., "Near-surface atomic segregation in YBCO thin films," *Physica C* **153-155**, 1435-1436, 1988.

Gavaler, J.R., Braginski, A.I., Talvacchio, J., Janocko, M.A., Forrester, M.G., and Greggi, J., "Fabrication of high-T_c superconducting $YBa_2Cu_3O_7$ films" *Extended Abstracts: High-Temperature Superconductors II*, Capone, D.W., Butler, W.H., Batlogg, B., and Chu, C.W. (Editors), 193-196, 1988, Materials Research Society Symposium Proceedings, 5-9 April 1988, Reno, Nevada.

Geballe, T.H., "High T_c thin-film superconductivity: Science and technology," *J. Appl. Phys.* **63** (8), 4003-4004, 15 April 1988.

Geserich, H.P., Scheiber, G., Geerk, J., Li, H.C., Linker, G., Assmus, W., and Weber, W., "Optical spectra of superconducting $YBa_2Cu_3O_{7-\delta}$ films: evidence for Cu^{2+} *d-d* transitions," *Europhys. Lett.* **6** (3), 277-282, 1 June 1988.

Greve, D.W., Stamper, A.K., Schlesinger, T.E., and Migliulo, M., "Influence of Y_2O_3/ZrO_2 buffer layers on sputtered films of $YBa_2Cu_3O_{6+x}$," Department of Electrical and Computer Engineering, Carnegie-Mellon University, Pittsburgh, PA 15213, preprint.

Gupta, S.K., Katti, V.R., Gandhi, D.P., Gadkari, S.C., Sabharwal, S.C., Gupta, K.K., Rajarajan, A.K., Gupta, L.C., and Vijayaraghavan, R., "On the preparation and the characterization of superconducting thin films of $YBa_2Cu_3O_{7-x}$," *Pramana* **30** (4), L341-L344, April 1988.

Gurvitch, M. and Fiory, A.T., "A metal-alloy process for the formation of oxide suprconducting films: advantages, problems, substrate interactions, buffer layers," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 297-301, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA.

Gurvitch, M. and Fiory, A.T., "Preparation and substrate reactions of superconducting Y-Ba-Cu-O films," *Appl. Phys. Lett.* **51** (13), 1027-1029, 28 Sept. 1987.

Han, Z., Bourget, L., Li, H., Ulla, M., Millman, W.S., Baum, H.P., Xu, M.F., Sarma, B.K., Levy, M., and Tonner, B.P., "Single-target sputter deposition, post-processing and electron spectroscopy of perovskite superconductor thin films," *AIP Conf. Proc.* **165**, 66-70, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Han, Z., Tsushima, K., Malmhall, R., and Rao, K.V., "Rapidly annealing method for preparing superconducting films," *Physica C* **153-155**, 780-781, 1988.

Harshavardhan, K.S., "Superconducting Y-Ba-Cu-O thin films by RF sputtering," *Pramana* **30** (5),

L449-L453, May 1988.

Hauser, B., Diegel, M., and Rogalla, H., "Preparation of thin-film YBaCuO quantum interference devices with a lift-off technique," *Appl. Phys. Lett.* **52** (10), 844-846, 7 March 1988.

Hauser, B. and Rogalla, H., "Preparation and properties of YBaCuO films," Commission of the European Communities *European Workshop on High T_c Superconductors and Potential Applications*, Proceedings, 441-2, 1987, 1-3 July 1987, Genova, Italy, Publ: Comm. Eur. Communities, Brussels, Belgium.

Hauser, B. and Rogalla, H., "Study of the preparation and properties of YBaCuO-films," *Novel Superconductivity*, Wolf, S.A. and Kresin, V.Z. (Editors), 951-9, 1987, Proceedings of the International Workshop on Novel Mechanisms of Superconductivity, 22-26 June 1987, Berkeley, CA, USA, Publ: Plenum, New York, NY.

Hoenig, H.E., Behner, H., Freller H., Friedrich, F., Gieres, G., Gunzelman, K.H., Herkert, W., Neumuller, H.W., Schultz, L., Wilhelm, M., Wohlleben, K., Bruchhaus, R., Eibl, O., Einzinger, R., Holubarsch, W., Schmidt, H., Szulczyk, A., and Thoener, M., "Status of HTS activities at Siemens," *Physica C* **153-155**, 1433-1434, 1988.

Hong, M., Kwo, J., Chen, C.H., Fleming, R.M., Liou, S.H., Gross, M.E., Davidson, B.A., Chen, H.S., Nakahara, S., and Boone, T., "Thin film research on high T_c superconductors," *AIP Conf. Proc.* **165**, 12-27, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Hong, M., Liou, S.H., Kwo, J., and Davidson, B.A., "Superconducting Y-Ba-Cu-O oxide films by sputtering," *Appl. Phys. Lett.* **51** (9), 694-696, 31 Aug. 1987.

Houdy, P., Sirat, J.A., Theeten, J.B., Landesman, J.P., Baudry, H., Monneraye, M., Schiller, C., and Patillon, J.N., "Amorphization evidence from kinetic ellipsometry in monolayer-controlled deposition of RF sputtered YBaCuO compounds," *AIP Conf. Proc.* **165**, 122-129, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Humphreys, R.G., Chew, N.G., Satchell, J.S., Edwards, J.A., and Dosser, O.D., "High T_c sputtered $YBa_2Cu_3O_x$ films," *Physica C* **153-155**, 1044-1045, 1988.

Ichikawa, Y., Adachi, H., Mitsuyu, T., and Wasa, K., "Effect of overcoating with dielectric films on the superconductive properties of the high-T_c Y-Ba-Cu-O films," *Jpn. J. Appl. Phys. 2* **27** (3), L381-L383, March 1988.

Itozaki, H., Tanaka, S., Harada, K., Fujimori, N., and Yazu, S, "Properties of high T_c Y-Ba-Cu-O thin films prepared by sputtering," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 407, 1987, 28-29 Aug. 1987, Tokyo, Japan, Publ: Yokohama Nat. Univ., Yokohama, Japan.

Jarvinen, R., Lepisto, T.K., Laurila, J., Kettunen, P., and Mantyla, T, "Preparation and microstructural features of two superconductive Y-Ba-Cu-O type materials," Commission of the European Communities *European Workshop on High T_c Superconductors and Potential Applications*, Proceedings, 303-4, 1987, 1-3 July 1987, Genova, Italy, Publ: Comm. Eur. Communities, Brussels, Belgium.

Jin, B.Y., Lee, S.J., Song, S.N., Hwu, S.-J., Thiel, J., Poeppelmeier, K.R., and Ketterson, J.B., "High T_c Y-Ba-Cu-O thin films prepared by DC magnetron sputtering," *Adv. Ceram. Mater.* **2** (3B), 436-443, July 1987.

Kang, J.H., Kampwirth, R.T., Gray, K.E., Wagner, A., and Huff, E.A., "Preparation of superconducting $YBa_2Cu_3O_{7-x}$ films by magnetron sputtering," *Extended Abstracts: High-Temperature Superconductors II,* Capone, D.W., Butler, W.H., Batlogg, B., and Chu, C.W. (Editors), 209-210, 1988, Materials Research Society Symposium Proceedings, 5-9 April 1988, Reno, NV, USA.

Kapitulnik, A., "Properties of films of high-T_c perovskite superconductors," *Physica C* **153-155**, 520-526, 1988.

Katoh, Y., Asahi, M., Asano, H., and Michikami, O., "Preparation of YBaCuO thin film dc SQUID," *Jpn. J. Appl. Phys. 2* **27** (6), L1110-L1112, June 1988.

Koinuma, H., Takemura, Y., Hashimoto, T., Takeuchi, K., and Fueki, K., "Reversible resistivity control of $Ba_2YCu_3O_{7-\delta}$ thin films by laser annealing," *Jpn. J. Appl. Phys. 2* **27** (4), L652-L654, April 1988.

Komuro, M., Kozono, Y., Yazawa, Y., Ohno, T., Hanazono, M., Matsuda, S., and Sugita, Y., "Structures and superconducting properties of Y-Ba-Cu-O sputtered films," *Jpn. J. Appl. Phys. 2* **26** (11), L1907-L1909, Nov. 1987.

Kuriki, S., Watanabe, M., and Ishibashi, T, "Sputter-deposition and annealing of Y-Ba-Cu-O films on different substrates," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 403, 1987, 28-29 Aug. 1987, Tokyo, Japan, Publ: Yokohama Nat. Univ., Yokohama, Japan.

Lanchbery, J.F., "The formation of thin Y-Ba-Cu oxide films by RF sputtering," *J. Phys. D* **21** (3), 538-541, 14 March 1988.

Lee, S.J., Rippert, E.D., Jin, B.Y., Song, S.N., Hwu, S.J., Poeppelmeier, K., and Ketterson, J.B., "Preparation of Y-Ba-Cu-O thin films on MgO by DC magnetron sputtering from a stoichiometric $Y_1Ba_2Cu_3O_{7-\delta}$ target," *Appl. Phys. Lett.* **51** (15), 1194-1196, 12 Oct. 1987.

Lee, S.Y., Murdock, B., Chin, D., and VanDuzer, T., "Microprobe characterization of sputtered high T_c superconducting films on silicon," *AIP Conf. Proc.* **165**, 427-434, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Lee, W.Y., Salem, J., Lee, V., Huang, T., Savoy, R., Deline, V., and Duran, J., "High T_c $YBa_2Cu_3O_{7-x}$ thin films on Si substrates by dc magnetron sputtering from a stoichiometric oxide target," *Appl. Phys. Lett.* **52** (26), 2263-2265, 27 June 1988.

Lee, W.Y., Salem, J., Lee, V., Rettner, C.T., Gorman, G., Savoy, R., Deline, V., Huang, T.C., and Chung, D.W., "Effects of deposition conditions on the superconducting properties of RF and DC magnetron sputter-deposited $YBa_2Cu_3O_{7-x}$ films," IBM Research Division, Almaden Research Center, 650 Harry Road, San Jose, CA 95120-6099, preprint.

Lee, W.Y., Salem, J., Lee, V., Rettner, C.T., Lim, G., Savoy, R., and Deline, V., "High T_c $YBa_2Cu_3O_{7-x}$ superconducting thin films by RF magnetron sputtering," *AIP Conf. Proc.* **165**, 95-105, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors,

6 Nov. 1987, Anaheim, CA, USA.

Li, H.C., Linker, G., Ratzel, F., Smithey, R., and Geerk, J., "In situ preparation of Y-Ba-Cu-O superconducting thin films by magnetron sputtering," *Appl. Phys. Lett.* **52** (13), 1098-1100, 28 March 1988.

Lin, R.J., Chen, Y.C., Kung, J.H., and Wu, P.T., "Preparation of Y-Ba-Cu-O superconducting films by modified DC sputtering process," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 319-322, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Lin, R.J., Kung, J.H., and Wu., P.T., "High T_c superconducting thin film fabrication by modified dc sputtering process," *Physica C* **153-155**, 796-797, 1988.

Liou, S.H., Hong, M., Davidson, B.A., Farrow, R.C., Kwo, J., Hsieh, T.C., Fleming, R.M., Chen, H.S., Feldman, L.C., Kortan, A.R., and Felder, R.J., "High T_c superconducting Y-Ba-Cu-O oxide films by sputtering and molecular beam epitaxy: morphology, structural characterization and superconducting properties," *AIP Conf. Proc.* **165**, 79-86, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Liou, S.H., Hong, M., Kwo, J., Davidson, A., Chen, H.S., Nakahara, S., Boone, T., and Felder, R.J., "Y-Ba-Cu-O films by rf magnetron sputtering using single composite targets: superconducting and structural properties," *Appl. Phys. Lett.*, in press. AT&T Bell Laboratories, Murray Hill, New Jersey 07974, preprint.

Logothetis, E.M., Soltis, R.E., Ager, R.M., Win, W., McEwan, C.J., Chang, K., Chen, J.T., Kushida, T., and Wenger, L.E., "Deposition and characterization of superconducting YBaCuO films," *Physica C* **153-155**, 1439-1440, 1988.

Makous, J.L., Maritato, L., Falco, C.M., Cronin, J.P., Rajendran, G.P., Uhlmann, E.V., and Uhlmann, D.R., "Superconducting and structural properties of sputtered thin films of $YBa_2Cu_3O_{7-x}$," *Appl. Phys. Lett.* **51** (25), 2164-2166, 21 Dec. 1987.

Mannhart, J., Scheuermann, M., Tsuei, C.C., Oprysko, M.M., Chi, C.C., Umbach, C.P., Koch, R.H., and Miller, C., "Micropatterning of high T_c films with an excimer laser," *Appl. Phys. Lett.* **52** (15), 1271-1273, 11 April 1988.

Marshall, A.F., Barton, R.W., Char, K., Kapitulnik, A., Oh, B., Hammond, R.H., and Laderman, S.S., "Ordered-defect structure in epitaxial $YBa_2Cu_3O_{7-x}$ thin films," *Phys. Rev. B* **37** (16), 9353-9358, 1 June 1988.

Matsui, S., Ochiai, Y., Kojima, Y., Tsuge, H., Takado, N., Asakawa, K., Matsutera, H., Fujita, J., Yoshitake, T., Kubo, Y., et al, "Focused ion beam processes for high-T_c superconductors," *J. Vac. Sci. Technol. B* **6** (3), 900-905, May 1988.

Matsui, S., Ochiai, H., Matsutera, H., Fujita, J., Yoshitake, T., and Kubo, Y., "Annealing effects for implanted Y-Ba-Cu-O superconductors," *J. Appl. Phys.* **64** (2), 936-938, 15 July 1988.

Matsui, S., Takado, N., Tsuge, H., and Asakawa, K., "Reactive ion beam etching of Y-Ba-Cu-O superconductors," *Appl. Phys. Lett.* **52** (1), 69-71, 4 Jan. 1988.

Meyer, O., Weschenfelder, F., Geerk, J., Li, H.C., and Xiong, G.C., "Epitaxial growth of $YBa_2Cu_3O_7$ thin films on (100)-$SrTiO_3$," *Phys. Rev. B* **37** (16), 9757-9760, 1 June 1988.

Michikami, O., Asano, H., Katoh, Y., Kubo, S., and Tanabe, K., "Synthesis of Y-Ba-Cu-O thin films on sapphire substrates by RF magnetron sputtering," *Jpn. J. Appl. Phys. 2* **26** (7), L1199-L1201, July 1987.

Miller, D.C., Fowler, D.E., Brundle, C.R., and Lee, W.Y., "Photoemission studies of sputtered thin films and bulk samples of the 1-2-3 high T_c superconductor," *AIP Conf. Proc.* **165**, 336-348, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Miura, T., Terashima, Y., Sagoi, M., and Kubo, K., "Low temperature preparation of as-sputtered superconducting YBaCuO thin films by magnetron sputtering," *Jpn. J. Appl. Phys. 2* **27** (7), L1260-L1261, July 1988.

Mizushima, K., Sagoi, M., Miura, T., and Yoshida, J., "Electric properties of the $YBa_2Cu_3O_{7-\delta}$/Au interface," *Appl. Phys. Lett.* **52** (13), 1101-1102, 28 March 1988.

Mochiku, T., Kanke, Y., Ohkuma, H., Yokoyama, S., Iguchi, I., and Yamaka, E, "Properties of Y-Ba-Cu-O thin films by RF-magnetron sputtering," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 398, 1987, 28-29 Aug. 1987, Tokyo, Japan, Publ: Yokohama Nat. Univ., Yokohama, Japan.

Morohashi, S., Tamura, H., Yoshida, A., Hasuo, S., "Plasma polymerization for high T_c oxide superconductors," *Appl. Phys. Lett.* **52** (22), 1897-1898, 30 May 1988.

Morris, G.W., Blamire, M.G., Somekh, R.E., Tomlinson, E.J., and Evetts, J.E., "The deposition, fabrication and characteristics of high critical temperature devices," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 197-202, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Murakami, T., Enomoto, Y., and Suzuki, M., "Preparation and properties of high T_c superconducting oxide thin films," *Physica C* **153-155**, 1690-1695, 1988.

Murakami, T., Enomoto, Y., Suzuki, M., Moriwaki, K., and Oda, M., "Critical current and stability of epitaxially grown $Ba_2YCu_3O_{7-y}$ thin films," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.3, 2037, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

Myoren, H., Nishiyama, Y., Nasu, H., Imura, T., Osaka, Y., Yamanaka, S., and Hattori, M., "Epitaxial growth of $Ba_2YCu_3O_x$ thin film on epitaxial ZrO_2/Si(100)," *Jpn. J. Appl. Phys. 2* **27** (6), L1068-L1070, June 1988.

Oh, B., Char, K., Kent, A.D., Naito, M., Beasley, M.R., Geballe, T.H., Hammond, R.H., Kapitulnik, A., and Graybeal, J.M., "Upper critical field, fluctuation conductivity, and dimensionality of $YBa_2Cu_3O_{7-x}$," *Phys. Rev. B* **37** (13), 7861-7864, 1 May 1988.

Ohkuma, H., Mochiku, T., Kanke, Y., Wen, Z., Yokoyama, S., Asano, H., Iguchi, I., and Yamaka, E., "Preparation of Y-Ba-Cu-O thin films by RF-magnetron sputtering," *Jpn. J. Appl. Phys. 2* **26** (9),

L1484-L1486, Sept. 1987.

Onuma, Y., Kamimura, K., Nakao, M., Kunugi, K., and Kubota, M., "Y-Ba-Cu-O thin films formed on alumina ceramic substrates coated with yttria stabilized zirconia layer," *Jpn. J. Appl. Phys. 1* **27** (7), 1351-1352, July 1988.

Pallix, J.B., Becker, C.H., Missert, N., Char, K., and Hammond, R.H., "Depth profiling of superconducting thin films using rare gas ion sputtering with laser postionization," *AIP Conf. Proc.* **165**, 413-420, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Pallix, J.B., Becker, C.H., and Newman, N., "Analysis of thin-film systems using nonresonant multiphoton ionization," *J. Vac. Sci. Technol. A* **6** (3), 1049-1052, May 1988.

Park, S.I., Scheuermann, M.R., Chi, C.C., and Tsuei, C.C., "Effect of uniaxial strain on the superconducting transition temperature in thin $YBa_2Cu_3O_7$ film," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 685-688, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Pavuna, D., Baer, W., Berger, H., Gasparov, V., Schmidt, M., Vasey, F., and Reinhart, F.-K., "Ion beam sputtering and properties of superconducting YBaCuO thin films," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 681-684, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Pavuna, D., Baer, W., Berger, H., Mathieu, H.J., Vogel, A., Schmidt, M., Gasparov, V., Affronte, M., Vasey, F., and Reinhart, F.K., "Ion beam sputtering and properties of YBaCuO superconducting thin films," *Physica C* **153-155**, 1449-1450, 1988.

Perrin, A., Li, Z.Z., Padiou, J., and Sergent, M., "High T_c superconducting thin films of $YBa_2Cu_3O_{7-x}$ obtained via d.c. sputtering on zirconium oxides, $SrTiO_3$ and Y_2BaCuO_5," *Physica C* **153-155**, 774-775, 1988.

Perrin, A., Li, Z.Z., Pena, O., Padiou, J., and Sergent, M., "DC sputtering elaboration of thin films of the high-T_c superconductor $YBa_2Cu_3O_{7-x}$: evidence for strong film-substrate interactions," *Rev. Phys. Appl.* **23** (32), 57-64, March 1988.

Poppe, U., Schubert, J., and Evers, W., "Preparation of $YBa_2Cu_3O_{7-y}$ thin films at low temperatures," *Physica C* **153-155**, 776-777, 1988.

Qi, Zh., Shi, W., Sun, J., Ke, H., and Liu, L., "An investigation of the film growth of Y-Ba-Cu-O by dc magnetron sputtering," *J. Phys. D* **21** (6), 1040-1042, 14 June 1988.

Rauhala, E., Keinonen, J., and Jarvinen, R., "Ion beam analysis of oxygen distribution in superconducting $YBa_2Cu_3O_x$," *Appl. Phys. Lett.* **52** (18), 1520-1522, 2 May 1988.

Raven, M.S., "DC magnetron sputtering of Y-Ba-Cu-O on Si(100)," *Electron. Lett.* **24** (6), 341-343, 17 March 1988.

Reydet, P.L., Brunel, M., Marcus, J., Escribe-Filippini, C., and Bruyere, J.C., "Structural and electrical properties of high T_c superconducting $YBa_2Cu_3O_{7-x}$ sputtered thin films," *Physica C* **153-155**, 806-807, 1988.

Rossnagel, S.M., and Cuomo, J.J., "Negative ion effects during magnetron and ion beam sputtering of $YBa_2Cu_3O_x$," *AIP Conf. Proc.* **165**, 106-113, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Saito, Y., Sakabe, K., Ishihara, K., Manaka, K., and Suganomata, S., "Preparation of Y-Ba-Cu-O films by dc sputtering," *Jpn. J. Appl. Phys. 1* **27** (6), 1103-1104, June 1988.

Scheuermann, M., Chi, C.C., Tsuei, C.C., Yee, D.S., Cuomo, J.J., Laibowitz, R.B., Koch, R.H., Braren, B., Srinivasan, R., and Plechaty, M.M., "Magnetron sputtering and laser patterning of high transition temperature Cu oxide films," *Appl. Phys. Lett.* **51** (23), 1951-1953, 7 Dec. 1987.

Schmitt, P., Adrian, H., Gerhauser, W., Mohle, W., and Hensel, B., "Preparation of superconducting thin films of $YBa_2Cu_3O_7$ by dc-magnetron-sputtering," *Physica C* **153-155**, 782-783, 1988.

Selinder, T.I., Larsson, G., Helmersson, U., Olsson, P., Sundgren, J.-E., Rudner, S., "Target presputtering effects on stoichiometry and deposition rate of Y-Ba-Cu-O thin films grown by dc magnetron sputtering," *Appl. Phys. Lett.* **52** (22), 1907-1909, 30 May 1988.

Shah, S.I. and Carcia, P.F., "Growth of $YBa_2Cu_3O_{7-x}$ thin films by ion beam sputtering," *Mater. Lett.* **6** (3), 49-52, Dec. 1987.

Shah, S.I. and Carcia, P.F., "Growth of $YBa_2Cu_3O_{7-x}$ thin films by sputtering," *AIP Conf. Proc.* **165**, 50-57, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Shah, S.I. and Carcia, P.F., "Superconductivity and resputtering effects in RF sputtered $YBa_2Cu_3O_{7-x}$ thin films," *Appl. Phys. Lett.* **51** (25), 2146-2148, 21 Dec. 1987.

Shi, W., Sun, J., Yao, W., Jiang, J., Liu, L., Yin, H., and Qi, Zh., "A study of deposited YBaCuO thin-films by DC magnetron sputtering," *Mod. Phys. Lett. B* **1** (9-10), 369-374, Jan. 1988.

Shih, I. and Qiu, C.X., "Chemical etching of Y-Cu-Ba-O thin films," *Appl. Phys. Lett.* **52** (18), 1523-1524, 2 May 1988.

Silver, R.M., Talvacchio, J., and de Lozanne, A.L., "Sputter deposition of $YBa_2Cu_3O_{7-y}$ thin films," *Appl. Phys. Lett.* **51** (25), 2149-2151, 21 Dec. 1987.

Sobolewski, R., Konopka, A., and Konopka, J., "Microwave absorbtion in $YBa_2Cu_3O_{7-y}$ thin films," *Physica C* **153-155**, 1431-1432, 1988.

Somekh, R.E., Blamire, M.G., Barber, Z.H., Butler, K., James, J.H., Morris, G.W., Tomlinson, E.J., Schwarzenberger, A.P., Stobbs, W.M., and Evetts, J.E., "High superconducting transition temperatures in sputter-deposited YBaCuO thin films," *Nature* **326** (6116), 857-859, 30 April 1987.

Srivastava, P.K., Debely, P., Hinterman, H.E., Leeman, C., Weber, J., Caccivio, O., Martinoli, P., and Ott, H.R., "Inductive conductance measurements of YBaCuO films," *Physica C* **153-155**, 1443-1444,

1988.

Stamper, A., Greve, D.W., Wong, D., and Schlesinger, T.E., "Sputter deposition of $YBa_2Cu_3O_{6+x}$ on alumina and the influence of ZrO_2 buffer layers," *Appl. Phys. Lett.* **52** (20), 1746-1748, 16 May 1988.

Takagi, K., Hirao, M., Hiratani, M., Kakibayashi, H., Aida, T., and Takayama, S., "Growth of $YBa_2Cu_3O_{7-\delta}$ single crystals and films by a flux and a sputtering method," *High-Temperature Superconductors*, Brodsky, M.B., Dynes, R.C., Kitazawa, K., and Tuller, H.L. (Editors), 1987, Materials Research Society Symposium Proceedings **99**, 647-650, 1987 Fall Meeting of the Materials Research Society, 30 Nov.-4 Dec. 1987, Boston, MA, USA.

Talvacchio, J., Silver, R.M., Gavaler, J.R., Janocko, M.A., and Braginski, A.I, "Sputtered and evaporated $YBa_2Cu_3O_7$ film and interface properties," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 412, 1987, 28-29 Aug. 1987, Tokyo, Japan, Publ: Yokohama Nat. Univ., Yokohama, Japan.

Terada, N., Ihara, H., Jo, M., Hirabayashi, M., Kimura, Y., Matsutani, K., Hirata, K., Ohno, E., Sugise, R., and Kawashima, F., "Sputter synthesis of $Ba_2YCu_3O_y$ as-deposited superconducting thin films from stoichiometric target—A mechanism of compositional deviation and its control," *Jpn. J. Appl. Phys. 2* **27** (4), L639-L642, April 1988.

Tomita, M., Hayashi, T., Takaoka, H., Ishii, Y., Enomoto, Y., and Murakami, T., "Cross-sectional TEM observation of $Ba_2YCu_3O_{7-x}$ film on $SrTiO_3$," *Jpn. J. Appl. Phys. 2* **27** (4), L636-L638, April 1988.

Tsuda, K., Muroi, M., Matsui, T., Koinuma, Y., Nagano, M., and Mukae, K., "Fabrication of the superconducting $YBa_2Cu_3O_y$ thin films," *Physica C* **153-155**, 788-789, 1988.

Wang, H., Li, L., Zhao, B., Lu, Y., Shi, Y., Zhao, Y., Yuan, C., and Gao, J., "Morphology and structure of high T_c YBaCuO thin films," *Chin. Phys. Lett.* **5** (1), 5-8, 1988.

Wang, H.S., Zhang, Y.Z., Yuan, C.W., Zhao, Y.Y., Zhao, B.R., Lu, Y., and Li, L., "Superconducting and normal state properties of YBaCuO thin films sputtered on ZrO_2 substrates and their morphology," *Mod. Phys. Lett. B* **2** (3-4), 635-640, May 1988.

Wang, W.N., Lu, H.B., Lin, W.J., Yao, P.C., Hsu, H.E., Tai, M.F., and Ku, H.C., "Formation of high-T_c films on Y_2BaCuO_5 substrate," *Jpn. J. Appl. Phys. 2* **27** (7), L1268-L1270, July 1988.

Wehner, G.K., Kim, Y.H., Kim, D.H., and Goldman, A.M., "Sputter deposition of $YBa_2Cu_3O_{7-x}$ films using a hemispherical target in a Hg vapor triode plasma," *Appl. Phys. Lett.* **52** (14), 1187-1189, 4 April 1988.

Whatmore, R.W., Cardwell, D.A., Cockburn, J.W., Patel, A., Osbond, P.C., Dorey, L.Y., Wort, C.J., and Ainger, F.W., "High T_c yttrium barium copper oxide ceramics and thin films," *Physica C* **153-155**, 790-791, 1988.

Wu, M.K., Ashburn, J.R., Higgins, C.A., Fellows, C.W., Loo, B.H., Burns, D.H., Ibrahim, A., Rolin, T.D., Peters, P.N., Sisk, R.C., and Huang, C.Y., "High-temperature processing of cuprate oxide superconductors," *Appl. Phys. Lett.* **52** (22), 1915-1917, 30 May 1988.

Xi, X.X., Li, H.C., Geerk, J., Linker, G., Meyer, O., Obst, B., Ratzel, F., Smithey, R., and Weschenfeld-

er, F., "Growth and properties of YBaCu-oxide superconducting thin films prepared by magnetron sputtering," *Physica C* **153-155**, 794-795, 1988.

Xiong, G.C., Li, H.C., Linker, G., and Meyer, O., "Transport properties, phase transition, and recovery near 200 K of proton-irradiated $YBa_2Cu_3O_7$ thin films," *Phys. Rev. B* **38** (1), 240-243, 1 July 1988.

Yee, D.S., Gambino, R.J., Chisholm, M.F., Cuomo, J.J., Madakson, P., and Karasinski, J., "Critical current and texture relationships in $YBa_2Cu_3O_7$ thin films," *AIP Conf. Proc.* **165**, 132-139, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

Yoshida, M., "Characteristics in the growth of the $YBa_2Cu_3O_x$ crystalline films," *Jpn. J. Appl. Phys. 2* **27** (7), L1248-L1250, July 1988.

Zhao, B., Wang, H., Lu, Y., Shi, Y., Huang, X., Zhao, Y., and Li, L., "Superconductivity at 89 K of Ba-Y-Cu-O thin films," *Chin. Phys. Lett.* **4** (6), 280-282, 1987.

Zhao, B., Wang, H., Lu, Y., Shi, Y., Li, L., Yuan, C., Zhao, Y., and Gao, J., "Study of Ba-Y-Cu-O thin films with zero resistance at LN_2 region prepared by magnetron sputtering," *Chin. Phys. Lett.* **4** (12), 529-532, 1987.

Zheng, J.Q., Zheng, G.G., Li, D.Q., Wang, W., Guan, W.Y., Zhao, B.R., Li, L., Wang, H.S., Lu, Y., and Shi, Y.H., "Study of Y-Ba-Cu-O high temperature superconducting thin films," *Jpn. J. Appl. Phys. Suppl.* **26-3**, pt.3, 2036, 1987, 18th International Conference on Low Temperature Physics, 20-26 Aug. 1987, Kyoto, Japan.

IV. Thin films of $YBa_2Cu_3O_7$ with substitutions for Y

Adachi, H., Hirochi, K., Setsune, K., Kitabatake, M., and Wasa, K., "Low-temperature process for the preparation of high T_c superconducting thin films," *Appl. Phys. Lett.* **51** (26), 2263-2265, 28 Dec. 1987.

Adachi, H., Setsune, K., Hirochi, K., Kamada, T., and Wasa, K., "Crystallinity and superconductivty of low temperature synthesized Ln-Ba-Cu-O thin films," *Physica C* **153-155**, 1696-1701, 1988.

Als-Nielsen, J., Alstrup, I., Alstrup, O., Andersen, N.H., Bilde-Sorensen, J.B., Bohr, H., Clausen, B.S., Clausen, K.N., Flensberg, K., Hansen, J.B., Jacobsen, C.S., Johannsen, I., Kragh, F., Larsen, J.G., Lebech, B., Levinsen, M.T., Nielsen, K.F., Nielsen, M., Padmanabhan, K.R., Pedersen, N.F., Skov, J.L., and Sorensen, O., "Synthesis and physical characterization of La-Sr-Cu-O, Y-Ba-Cu-O and Gd-Ba-Cu-O high T_c superconductors," Commission of the European Communities *European Workshop on High T_c Superconductors and Potential Applications*, Proceedings, 93-4, 1987, 1-3 July 1987, Genova, Italy,

Hatta, S., Higashino, H., Hirochi, K., Adachi, H., and Wasa, K, "Pt-coated substrate effect on oxide superconductive films in low-temperature processing," *Appl. Phys. Lett.* **53** (2), 148-150, 11 July 1988.

Hatta, S., Higashino, H., Hirochi, K., Adachi, H., and Wasa, K, "Strong effect of Pt coated substrate on crystalline properties of superconductive ErBaCu oxide films," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 396, 1987 28-29 Aug. 1987, Tokyo, Japan, Publ:

Yokohama Nat. Univ., Yokohama, Japan.

Hayashi, S., Kamada, T., Setsune, K., Hirao, T., Wasa, K., and Matsuda, A., "The orthorhombic-to-tetragonal phase transition in sputtered Gd-Ba-Cu-O thin films by low temperature processing," *Jpn. J. Appl. Phys. 2* **27** (7), L1257-L1259, July 1988.

Hirochi, K., Adachi, H., Setsune, K., Yamazaki, O., and Wasa, K., "Thickness dependence of superconductivity in as-sputtered Er-Ba-Cu-O thin films," *Jpn. J. Appl. Phys. 2* **26** (11), L1837-L1838, Nov. 1987.

Itozaki, H., Tanaka, S., Higaki, K., and Yazu, S., "High J_c superconducting thin films prepared by sputtering," *Physica C* **153-155**, 1155-1158, 1988.

Itozaki, H., Tanaka, S., Higaki, K., and Yazu, S., "High T_c and J_c superconducting thin films prepared by sputtering," *Extended Abstracts: High-Temperature Superconductors II,* Capone, D.W., Butler, W.H., Batlogg, B., and Chu, C.W. (Editors), 205-208, 1988, Materials Research Society Symposium Proceedings, 5-9 April 1988, Reno, NV, USA.

Kamada, T., Setsune, K., Hirao, T., and Wasa, K., "Structure and superconducting properties of sputtered Gd-Ba-Cu-O thin films," *Appl. Phys. Lett.* **52** (20), 1726-1728, 16 May 1988.

Kapitulnik, A., Oh, B., Naito, M., Char, K., Kent, A.D., Missert, N., Hellman, E., Arnason, S., Hsu, J.W.P., Hahn, M.R., Rosenthal, P., Barton, R., Beasley, M.R., Geballe, T.H., and Hammond, R.H., "Superconducting properties of thin films of the high-T_c perovskite superconductors," *Proceedings of the Adriatico Research Conference on High Temperature Superconductors,* Lundqvist, S., Tosatti, E., Tosi, M.P., and Lu, Y. (Editors), 131-149, 1987, 5-8 July 1987, Trieste, Italy, Publ: World Scientific, Singapore, (also treats La-Sr-Cu-O).

Kataoka, N., Furukawa, S., Matsuzaki, K., Inoue, A., and Masumoto, T., "High-T_c superconductors prepared by oxidation of vapor-quenched amorphous alloy films in Ba-Y-Cu and Ba-Yb-Cu systems," *Jpn. J. Appl. Phys. 2* **27** (1), L70-L72, Jan. 1988.

Kawasaki, M., Nagata, S., Sato, Y., Funabashi, M., Hasegawa, T., Kishio, K., Kitazawa, K., Fueki, K., and Koinuma, H., "High T_c Yb-Ba-Cu-O thin films deposited on sintered YSZ substrates by sputtering," *Jpn. J. Appl. Phys. 2* **26** (5), L738-L740, May 1987.

Kitabatake, M., Adachi, H., Setsune, K., Hirochi, K., Hatta, S., and Wasa, K., "Preparation and characterization of as-deposited high T_c superconductive thin films," *Extended Abstracts: High-Temperature Superconductors II,* Capone, D.W., Butler, W.H., Batlogg, B., and Chu, C.W. (Editors), 201-203, 1988, Materials Research Society Symposium Proceedings, 5-9 April 1988, Reno, NV, USA.

Nagata, S., Kawasaki, M., and Koinuma, H., "Light irradiation effect on the preparation of high-T_c Yb-Ba-Cu-O superconducting thin films," *Jpn. J. Appl. Phys. 2* **27** (5), L870-L872, May 1988.

Tanaka, S., and Itozaki, H., "High-J_c superconducting single crystalline HoBaCuO thin films by sputtering," *J. J. Appl. Phys. 2* **27** (4), L622-L624, April 1988.

Tonouchi, M., Yoshizako, Y., and Kobayashi, T, "Sputter-formation and patterning process of high T_c Y-Ba-Cu-O and Er-Ba-Cu-O films," *Extended Abstracts* of 1987 International Superconductivity Electronics Conference, 394, 1987, 28-29 Aug. 1987, Tokyo, Japan, Publ: Yokohama Nat. Univ., Yokoha-

ma, Japan.

Tonouchi, M., Yoshizako, Y., Takahashi, T., Sakaguchi, Y., Kita, S., Fujiwara, Y., and Kobayashi, T., "High T_c superconductivity of RF-sputtered Er-Ba-Cu-O films," *Jpn. J. Appl. Phys. 2* **26** (9), L1462-L1464, Sept. 1987.

Wasa, K., Kitabatake, M., Adachi, H., Setsune, K., and Hirochi, K., "Superconducting Y-Ba-Cu-O and Er-Ba-Cu-O thin films prepared by sputtering deposition," *AIP Conf. Proc.* **165**, 38-49, 1988, Topical Conference on Thin Film Processing and Characterization of High-Temperature Superconductors, 6 Nov. 1987, Anaheim, CA, USA.

V. Bi-Sr-Ca-Cu-O Thin Films

Adachi, H., Ichikawa, Y., Setsune, K., Hatta, S., Hirochi, K., and Wasa, K., "Preparation and properties of superconducting Bi-Sr-Ca-Cu-O thin films," *Jpn. J. Appl. Phys. 2* **27** (4), L643-L645, April 1988.

Ballentine, P.H., Kadin, A.M., Argana, J., Rath, R.C., and McCluskey, P., "Thin films of high-T_c superconductors by RF magnetron sputtering from a single oxide target," Metallurgical Society conference on *Processing and Applications of High T_c Superconductors*, 9-11 May 1988, New Brunswick, NJ, USA, Publ: The Metallurgical Society, in press. Department of Electrical Engineering, University of Rochester, Rochester, NY 14627, preprint (also treats Y-Ba-Cu-O).

Face, D.W., Neal, M.J., Matthiesen, M.M., Kucera, J.T., Crain, J., Graybeal, J.M., Orlando, T.P., and Rudman, D.A., "Preparation of superconducting thin films of bismuth strontium calcium copper oxides by reactive sputtering," *Appl. Phys. Lett.* **53** (3), 246-248, 18 July 1988.

Fukotomi, M., Machida, J., Tanaka, Y., Asano, T., Maeda, H., and Hoshino, K., "Sputter deposition of BiSrCaCuO thin films," *Jpn. J. Appl. Phys. 2* **27** (4), L632-L633, April 1988.

Han, Z., Tsushima, K., Karpe, N., Medelius, H., Jacobson, K., and Rao, K.V., "Preparation and electronic properties of reactive magnetron sputter-deposited Bi-Sr-Ca-Cu-O thin film high T_c superconductors," *J. Cryst. Growth*, in press. Department of Solid State Physics, Royal Institute of Technology, S-100 44 Stockholm, Sweden, preprint.

Harker, A.B., Kobrin, P.H., Morgan, P.E.D., de Natale, J.F., Ratto, J.J., Gergis, I.S., and Howitt, D.G., "Reactive ion beam deposition of thin films in the bismuth-calcium-strontium-copper oxide ceramic superconductor system," *Appl. Phys. Lett.* **52** (25), 2186-2187, 20 June 1988.

Hatta, S., Ichikawa, Y., Hirochi, K., Setsune, K., Adachi, H., and Wasa, K., "Diamagnetic properties of high-T_c Bi-Sr-Ca-Cu-O superconducting thin films," *Jpn. J. Appl. Phys. 2* **27** (5), L855-L856, May 1988.

Ichikawa, Y., Adachi, H., Hirochi, K., Setsune, K., Hatta, S., and Wasa, K., "Superconducting properties of high-T_c Bi-Sr-Ca-Cu-O thin films," *Phys. Rev. B* **38** (1), 765-767, 1 July 1988.

Kadin, A.M., Ballentine, P.H., Argana, J., and Rath, R.C., "Superconducting properties of magnetron-sputtered $YBa_2Cu_3O_7$ films," *Proceedings of the Conference on Superconductivity & Applications*, 18-20 April 1988, Buffalo, NY, USA, in press. Department of Electrical Engineering, University of Rochester, Rochester, NY 14627, preprint (also treats Y-Ba-Cu-O).

Kang, J.H., Kampwirth, R.T., and Gray, K.E., "High critical field anisotropy of superconducting Bi-Sr-Ca-Cu oxide from highly oriented thin films," *Appl. Phys. Lett.* **52** (24), 2080-2082, 13 June 1988.

Kang, J.H., Kampwirth, R.T., Gray, K.E., Marsh, S., and Huff, E.A., "Superconductivity in thin films of the Bi-Ca-Sr-Cu-O system," *Phys. Lett. A* **128** (1-2), 102-104, 21 March 1988.

Kato, T., Doi, T., Kumagai, T., and Matsuda, S., "Superconducting Bi-Sr-Ca-Cu-O thin films by sputtering," *Jpn. J. Appl. Phys. 2* **27** (6), L1097-L1100, June 1988.

Koinuma, H., Kawasaki, M., Nagata, S., Takeuchi, K., and Fueki, K., "Preparation of high-T_c Bi-Sr-Ca-Cu-O superconducting thin films by AC sputtering," *Jpn. J. Appl. Phys. 2* **27** (3), L376-L377, March 1988.

Nakao M., Kuwahara, H., Yuasa, R., Mukaida, H., and Mizukami, A., "Magnetron sputtering of Bi-Ca-Sr-Cu-O thin films with superconductivity above 80 K," *Jpn. J. Appl. Phys. 2* **27** (3), L378-L380, March 1988.

Sullivan, B.T., Osborne, N.R., Hardy, W.N., Carolan, J.F., Yang, B.X., Michael, P.J., Parsons, R.R., "Bi-Sr-Ca-Cu-oxide superconducting thin films deposited by DC magnetron sputtering," *Appl. Phys. Lett.* **52** (23), 1992-1994, 6 June 1988.

VI. Tl-Ca-Ba-Cu-O Thin Films

Huang, T.C., Lee, W.Y., Lee, V.Y., and Karimi, R., "Structure and superconducting properties of $TlCa_{n-1}Ba_2Cu_nO_{2n+3}$ thin films with zero resistance at temperatures above 100K," IBM Research Division, Almaden Research Center, 650 Harry Road, San Jose, CA 95120-6099, preprint.

Kang, J.H., Kampwirth, R.T., and Gray, K.E., "Superconductivity in sputtered thin films of Tl-Ba-Ca-Cu-O," Materials Science Division, Argonne National Laboratory, Argonne, IL 60439, preprint.

Lee, W.Y., Lee, V.Y., Salem, J., Huang, T.C., Savoy, R., Bullock, D., and Parkin, S.S.P., "Superconducting Tl-Ca-Ba-Cu-O thin films with zero resistance at temperatures of up to 120 K," *Appl. Phys. Lett.* **53** (4), 329-331, 25 July 1988.

Nakao, M., Yuasa, R., Nemoto, M., Kuwahara, H., Mukaida, H., and Mizukami, A., "Sputtered Tl-Ca-Ba-Cu-O Thin Films with Zero Resistivity at 98 K," *Jpn. J. Appl. Phys. 2* **27** (5), L849-L851, May 1988.

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IBM Almaden Research Center, San Jose, California (6 papers)
Auerbach, D.J., Brundle, C.R., Bullock, D.C., Deline, V., Duran, J., Fowler, D.E., Gorman, G., Huang, T.C., Karimi, R., Lee, V.Y., Lee, W.Y., Lim, G., Miller, D.C., Rettner, C.T., Salem, J., and Savoy, R.J.

IBM Thomas J. Watson Reseach Center, Yorktown Heights, New York (8 papers)
Brady, M.J., Braren, B., Chi, C.C., Chisholm, M.F., Cuomo, J.J., Davidson, A., Gambino, R.J., Giess, E., Karasinski, J., Koch, R.H., Laibowitz, R.B., Madakson, P.B., Mannhart, J., Mikalsen, D.J., Oprysko, M.M., Palevski, A., Park, S.I., Plechaty, M.M., Rossnagel, S.M., Roy, R.A., Scheuermann, M., Scilla, G., Srinivasan, R., Tsuei, C.C., Umbach, C.P., and Yee, D.S.

Johns Hopkins University, Baltimore, Maryland (2 papers)
Chien, C.L., Childress, J., Cieplak, M.Z., Gang, X., Gavrin, A., and Streitz, F.H.

Lockheed Missiles & Space Company, Palo Alto, California (1 paper)

Huang, C.Y.

Massachusetts Institute of Technology, Cambridge, Massachusetts (3 papers)
Crain, J., Face, D.W., Graybeal, J.M., Kucera, J.T., Matthiesen, M.M., Neal, M.J., Orlando, T.P., and Rudman, D.A.

University of Minnesota, Minneapolis, Minnesota (1 paper)
Goldman, A.M., Kim, D.H., Kim, Y.H., and Wehner, G.K.

NASA Marshall Space Flight Center, Huntsville, Alabama (1 paper)
Peters, P.N. and Sisk, R.C.

Naval Research Laboratory, Washington, District of Columbia (2 papers)
Bender, B.A., Broussard, P.R., Claassen, J.H., Edelstein, A.S., Elam, W.T., Elam, T., Francavilla, T.L., Fuller, W.W., Gotaas, J.A., Gubser, D.U., Hein, R.A., Holtz, R.L., Kurtz, R., Lawrence, S.H., Lubitz, P., Mueller, D., Osofsky, M.S., Qadri, S.B., Rachford, F.J., Rhyne, J.J., Shih, A., Skelton, E.F., Stockbauer, R., Toth, L.E., and Wolf, S.A.

North Carolina State University, Raleigh, North Carolina (1 paper)
Auciello, O.

Northwestern University, Evanston, Illinois (2 papers)
Hwu, S.J., Jin, B.Y., Ketterson, J.B., Lee, S.J., Poeppelmeier, K.R., Rippert, E.D., Song, S.N., and Thiel, J.

Princeton University, Princeton, New Jersey (1 paper)
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University of Rochester, Rochester, New York (3 papers)
Ballentine, P.H. and Kadin, A.M.

Rockwell International Science Center, Thousand Oaks, California (2 papers)
DeNatale, J.F., Flintoff, J.F., Gergis, I.S., Harker, A.B., Housley, R.M., Howitt, D.G., Kobrin, P.H., Morgan, P.E.D., and Ratto, J.J.

San Jose State University, San Jose, California (1 paper)
Chung, D.W.

SRI International, Menlo Park, California (2 papers)
Becker, C.H., Newman, N., and Pallix, J.B.

Stanford University, Stanford, California (10 papers)
Arnason, S., Barton, R.W., Beasley, M.R., Bozovic, I., Char, K., Geballe, T.H., Hahn, M.R., Hammond, R.H., Hellman, E., Hsu, J.W.P., Hylton, T., Kapitulnik, A., Kent, A.D., Marshall, A.F., Missert, N., Naito, M., Oh, B., and Rosenthal, P.

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Lee, S.Y. and Murdock, B.

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Westinghouse R&D Center, Pittsburgh, Pennsylvania (5 papers)
Braginski, A.I., Forrester, M.G., Gavaler, J.R., Greggi, J., Janocko, M.A., Silver, R.M., and Talvacchio, J.R.

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Electrotechnical Laboratory, Ibaraki (5 papers)
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Foundation for Promotion of Material Science and Technology of Japan, Tokyo (1 paper)
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Mitsui Mining & Smelting Co., Ltd., Saitama (1 paper)
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University of Cambridge, Cambridge, United Kingdom (4 papers)
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Gao, J., Guan, W.Y., Huang, X., Jiang, J., Ke, H., Li, D.Q., Li, H.C., Li, L., Liu, L., Lu, Y., Qi, Zh., Shi, W., Shi, Y.H., Sun, J., Wang, H.S., Wang, W., Yao, W., Yin, H., Yuan, C.W., Zhang, Y.Z., Zhao, B.R., Zhao, Y.Y., Zheng, G.G., and Zheng, J.Q.

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Royal Institute of Technology, Stockholm, Sweden (2 papers)
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Behner, H., Freller H., Friedrich, F., Gieres, G., Gunzelman, K.H., Herkert, W., Hoenig, H.E., Neumuller, H.W., Schultz, L., Wilhelm, M., and Wohlleben, K.,

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