

New Mexico Section Hosts Regional Conference on High T_c Superconducting Materials

A very successful two-day workshop on "Developments in High-Temperature Superconducting Materials" was held October 1-2, 1987 at the Eldorado Hotel, Santa Fe, New Mexico. Sponsored by the New Mexico Section of the Materials Research Society, the meeting attracted significant regional and even national attention. Approximately 200 scientists attended, some coming from the East and West Coasts.

Over 40 papers were presented, covering new developments in theory, material properties, ceramic processing, single crystals, thick and thin film fabrication, and characterization of high T_c superconductors. In addition, more than 20 poster papers featured "late news" developments in a highly successful evening session. A literature exhibit by equipment, service, and material suppliers whose products are related to research in superconducting materials was held concurrent with the meeting. Eighteen exhibitors took advantage of this "mini-equipment and manufacturers show" coordinated by Vivienne Harwood Mattox (MRS Short Course Manager).

The meeting, run as a blend between a conventional conference and a Gordon-style workshop, was organized by Harold Anderson (University of New Mexico), George Samara (Sandia National Laboratories), and Michael Nastasi (Los Alamos National Laboratory), executive officers of the New Mexico Section. The format allowed for a discussion period after a set of talks in a given topical area. In these periods, individuals could present data and counter points. The participants needed no encouragement to use the podium in this regard, and their comments and insight greatly added to the quality of the program.

The opening plenary session highlighting the recent discoveries in high T_c superconductors featured a panel made up of J.E. Schirber (Sandia National Laboratories), J.L. Smith (Los Alamos National Laboratory), D. Spreen (Air Force Weapons Laboratory), S.R.J. Brueck (University of New Mexico), R.H. Hammond (Stanford University), C. Falco (University of Arizona), and J.S. Riley (Colorado State University). The presentations immediately sparked lively and often excited discussion. The influence of twinning on the superconducting properties of the material and claims of superconductivity near room temperature in new phases of the rare earth, barium-copper oxides evoked the greatest controversy.

For many attendees, the major revelations involved the apparent technological strides being made in the fabrication of high quality ceramic oxide superconductors. R.H. Hammond and C. Falco, for example, reported success in the ability to repeatably grow high quality thin films of the 1-2-3 ceramic oxide superconductors on a variety of substrates. Hammond's films were shown to have critical current densities comparable to those previously reported by IBM researchers. Falco demonstrated that a variety of buffer layers could be used to isolate the superconducting film from the influence of an underlying substrate. In thick film research, D.S. Ginley (Sandia) reported success on efforts to produce quality "thick" superconducting films based on a novel screen-print and lift-off process. In ceramic processing, R.E. Loehman (Sandia) produced discs several inches in diameter of hot-pressed 1-2-3 material shown to be stable for several months. In single-crystal growth, Z. Fisk (Los Alamos) reported further systematic efforts at understanding ordering in crystals of La_2CuO_4 , and T. Aselage (Sandia) reported on progress in understanding the phase stability and growth of yttrium-barium-copper-oxides. Finally, in addition to providing the conference with the latest information on the material properties underlying the physics of superconductors, J.L. Smith and J.E. Schirber described efforts at Los Alamos and Sandia to construct actual working devices with superconducting components such as motors, rf cavities, coaxial transmission lines, IR detectors, transformer analogs, and switches. Smith's advice was, "We should use superconductors to change the way we do things." This sort of thinking along with the examples of systematic, steady progress noted above typified the Santa Fe conference. In short, it was a real "working" conference.

Following the "open door" plenary session, the meeting went into "closed door" workshop sessions in order to promote a more open exchange of ideas and information on the latest high T_c superconductor research. In keeping with the spirit exemplified by a Gordon Conference style workshop, the proceedings of the closed workshop sessions of the Santa Fe conference will neither be published nor formally referenced. Requests for information regarding the presentations was left to the discretion of the authors, although many indicated that they could provide reprinted material on request. All of the authors and participants should be commended for the quality of their presentations and comments. The invited talks are listed at the end of this article.

The response of scientists and industry throughout the Southwest region and nationally to the Santa Fe conference is extremely encouraging to the New Mexico Section of the Materials Research Society. It proves that MRS local sections can play a vital role in organizing and hosting major conferences aimed at serving the needs of a region's materials research science community. The New Mexico Section anticipates hosting topical conferences of this nature on an annual basis. For further information on the future activities of the New Mexico Section, contact a member of the executive committee: Harold Anderson, University of New Mexico, (505) 277-5661; George Samara, Sandia National Laboratories, (505) 844-6653; Michael Nastasi, Los Alamos National Laboratory, (505) 667-7007.

Invited Talks

Consequences of Intergrain Josephson Coupling in Ceramic High T_c Superconductors, J.F. Kwak et al. (Sandia); Ab Initio Cluster Calculations of the Electronic Structure of Lanthanum Compounds, R. Martin and P.A. Saxe (Los Alamos); Magnetic Polarons in High T_c Superconductors, E.B. Stechel and D.R. Jennison (Sandia); Synthesis and Characterization of New High T_c Superconductors, P.E. Eller et al. (Los Alamos); Evidence for Superconductors above 100 K, J.S. Riley (CSU); Oxygen Content and Structural Features in Oxide Superconductors, I. Raistrick (Los Alamos); Synthesis and Structure Transformations during Sintering, R.B. Schwarz (Los Alamos); Single-Crystal Growth of Layered Perovskites, Z. Fisk (Los Alamos); High T_c Single-Crystal Studies, T. Aselage, et al. (Sandia); Microwave Synthesis and Characterization of $GdBa_2Cu_3O_7$ Superconductors, H. Sheinberg and D.S. Phillips (Los Alamos); Preparation and Properties of Hot Pressed 1,2,3 Materials, R.E. Loehman et al. (Sandia); Preparation and Characterization of Oxide Superconductors, D.E. Peterson (Los Alamos); High T_c Ceramic Oxide Thin Films, R.H. Hammond (Stanford); High T_c Ceramic Oxide Thick Films, D.S. Ginley et al. (Sandia); Ceramic Oxide Superconducting Films, C. Falco (U of A); Thin-Film Oxide Superconductor by Multilayer Evaporation, C. Maggiore and P. Arendt (Los Alamos); Susceptibility, Specific Heat and Transport, J.O. Willis (Los Alamos); Magnetization Studies of High T_c Superconductors, E.L. Venturini et al. (Sandia); Ion Beam Analysis of High T_c Superconductors, J.C. Barbour et al. (Sandia); TEM Studies of High T_c Materials, T.E. Mitchell (Los Alamos). 