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Preface

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PREFACE

The symposium on Chemistry and Physics of Molecular Based Magnetic Materials convened October 25–30, 1992 in Tokyo, Japan. This third international symposium on the subject focuses upon several key aspects that directly relate to design, preparation, and characterization of high spin and molecular/polymeric ferromagnets. While this symposium was neither numbered nor under the auspices of any authorized international body, it succeeded the symposium at the American Chemical Society meeting in Dallas, TX in 1989[1] and the NATO Advanced Research Workshop in Il Ciocco, Italy in 1990.[2] Sponsorship of this symposium was generously provided by the Chemical Society of Japan and the Ministry of Education, Science and Culture of Japan via the University of Tokyo. Additionally, the Inoue Foundation for Science, Gordon & Breach Scientific Publisers, Inc., Ciba-Geigy Foundation (Japan) for the Promotion of Science, the Kajima Foundation, the Asahi Glass Foundation, and Lake Shore Cryotronics, Inc. kindly provided additional support for the symposium and these contributions are gratefully acknowledged.

As expected, this multidisciplinary meeting brought together inorganic, organic, organometallic, polymer, and physical chemists as well as theoretical and experimental condensed matter physicists from Asia, Europe, and North America. We had 115 participants including 31 scientists from Denmark, France, Germany, Spain, and the USA. The meeting consisted of 21 invited talks and 69 contributed papers (25 oral plus 44 poster presentations) out of which 68 papers are published in these Proceedings.

The strategies for designing molecular/polymeric materials with ferromagnetic coupling include: [1] unpaired electrons in orthogonal orbitals sharing the same spatial region, [2] configurational interaction (CI) to stabilize either ferro- and antiferromagnetic coupling which may lead to bulk ferro- or ferrimagnetic behavior, and [3] dipole-dipole (through-space) exchange to stabilize ferromagnetic coupling. It was ubiquitously emphasized that the rational design of solid state structures remains an art that limits our ability to prepare the secondary and tertiary structures needed to test many concepts in solid state chemistry. Frequently, complex, solvated compositions with undesired or new structure types form instead of the desired phase. Additionally, several polymorphs may form in lieu of the desired structure type. This is particularly crucial for the formation of a ferro- or ferrimagnet as bulk magnetic behavior is a 3-D not 1-D property.

Several notable advances have been made since the last symposium on this subject:[2] (1) Achievements and limitations in purely organic high-spin polyradicals have been made with an $S = 9$ molecule being the largest high-spin molecules reported to date. (2) Very-high spin metal cluster complexes have been characterized. (3) New ferrimagnetic materials based on alternation of $S > 1/2$ 'up-spins' and $S = 1/2$ 'down-spins' have been reported. (4) New magnetically ordered materials with a T_c exceeding room temperature were described. (5) Bulk ferromagnetic behavior with $T_c <$ 2 K have been reported for a few organic nitroxides. (6) New strategies based on ferrimagnets, polarons, etc. have been developed.

Consequently, substantial progress has been made in this research area and the embryonic quest for molecular/polymer based magnetic materials is a thriving area of research.

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1 Proceedings on the Conference on *Ferromagnetic and High Spin Molecular Based Materials* (Eds.: J. S. Miller, D. A. Dougherty), *Mol. Cryst., Liq. Cryst.* **1989**, *176*.

2 Proceedings on the Conference on *Molecular Magnetic Materials: NATO ARW Molecular Magnetic Materials*, (Eds.: O. Kahn, D. Gatteschi, J. S. Miller, F. Palacio), Kluwer Acad. Pub., London, **1991**, *E198*.