FOREWORD

Focus on Organic Conductors

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Organic materials are usually thought of as electrical insulators. Progress in chemical synthesis, however, has brought us a rich variety of conducting organic materials, which can be classified into conducting polymers and molecular crystals. Researchers can realize highly conducting molecular crystals in charge-transfer complexes, where suitable combinations of organic electron donor or acceptor molecules with counter ions or other organic molecules provide charge carriers. By means of a kind of chemical doping, the charge-transfer complexes exhibit high electrical conductivity and, thanks to their highly crystalline nature, even superconductivity has been observed. This focus issue of *Science and Technology of Advanced Materials* is devoted to the research into such 'organic conductors'

The first organic metal was (TTF)(TCNQ), which was found in 1973 to have high conductivity at room temperature and a metal–insulator transition at low temperatures. The first organic superconductor was (TMTSF)2PF6, whose superconductivity under high pressures was reported by J´erome in 1980. After these findings, the research on organic conductors exploded. Hundreds of organic conductors have been reported, among which more than one hundred exhibit superconductivity. Recently, a single-component organic conductor has been found with metallic conductivity down to low temperatures.

In these organic conductors, in spite of their simple electronic structures, much new physics has arisen from the low dimensionality. Examples are charge and spin density waves, characteristic metal–insulator transitions, charge order, unconventional superconductivity, superconductor–insulator transitions, and zero-gap conductors with Dirac cones. The discovery of this new physics is undoubtedly derived from the development of many intriguing novel organic conductors. High quality single crystals are indispensable to the precise measurement of electronic states.

This focus issue includes comprehensive reviews on the chemistry and physics of recently found interesting organic conductors, as well as experimental and theoretical surveys of novel intriguing phenomena and electronic states of organic charge-transfer salts. Recent upheaval in organic electronics has reinvigorated interest in organic semiconductors. To reflect this trend, the focus issue contains reviews on organic transistor materials and single-crystal organic transistors.

We are grateful to all authors who contributed to the focus issue, and hope that it will become an important resource for the future development of this field.

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