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## Molecular Crystals and Liquid Crystals

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### Introduction

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# **PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON THE PHYSICS AND CHEMISTRY OF LOW-DIMENSIONAL SYNTHETIC METALS (ICSM 84)**

## **Abano Terme, Italy — 17-22 June, 1984**

### **INTRODUCTION**

In little more than one decade the field of low-dimensional conductors is grown to the point that nowadays it represents a well matured section of the modern research in solid state physics and chemistry. Besides metal chain compounds and charge transfer complexes which provided the first motivation and impetus for the research in this field, new materials such as conducting polymers and transition metal chalcogenides have attracted much interest from the standpoint of both fundamental studies and perspectives of applications. Despite the natural tendency to specialize on specific types of materials there remains a strong need for exchanging ideas and developing unifying views in the field of low-dimensional materials. In response to this requirement, the International Conference on the Physics and Chemistry of Low-Dimensional Synthetic Metals (ICSM 84) held in Abano Terme, Italy, June 17-22, 1984 has gathered from all over the world 476 scientists active in all fields of the research on synthetic metals. Thus, in a lively atmosphere, the conference has provided a unique opportunity of getting a very comprehensive outlook of the present status of the field. Scientific exchange and discussion has been of the utmost level and it likely provided stimulus for the development of new ideas for further research work.

Considerable improvement in the orientation and crystallinity of known conducting polymers has allowed a better characterization of the materials and improved the reproducibility of the experimental results. A unique achievement of this field is the successful application of guidelines suggested by quantum mechanical and model calculations for the synthesis of new conducting polymers. The main trends are toward a better chemical stability and an easier doping.

In the interpretation of the transport properties an increasing attention is being paid to the features of real materials such as the presence of amorphous regions, crosslinkings and the interactions between dopants and charge carriers. Their effects on the possible presence and dynamics of solitons, polarons and bipolarons has been extensively discussed at the meeting.

The issue of electron-electron interactions has been central in many theoretical papers in the sections of both conducting polymers and crystals. The consequences of these interactions in phenomena as diverse as the photoexcitation of conducting polymers and the CDW instability in charge transfer crystals has been discussed.

The search for new organic superconductors and the deeper investigation of the known materials belonging to the  $(\text{TMTSF})_2\text{X}$  family have been among the main research themes in the field of the charge transfer conductors. The discovery of new ambient pressure superconductors based on the  $(\text{BEDT-TTF})\text{-I}$  system and displaying critical temperatures up to 2.5 K has been one of the highlights.

A lively and successful discussion has developed at the meeting on the observation of the quantum Hall effect and new phase transitions under high magnetic field in  $(\text{TMTSF})_2\text{ClO}_4$ . Considerable progress has been reported on the theoretical understanding of these phenomena.

The number of contributions on transition metal chalcogenides and bronzes has grown with respect to the previous conferences of this series. Such a growth stems from the appearance of new classes of materials and the interest for incommensurability problems, CDW and non-linear transport phenomena.

As experienced in previous conferences, it is hard to judge the level of maturity of technological application of the synthetic metals given the reservedness of industries in communicating their results. What has been reported, and we believe was only the tip of the iceberg, concerned mainly the development of polymer batteries, polymer based detectors and photovoltaic cells.

The proceedings are being published as a series of five volumes in

"Molecular Crystals and Liquid Crystals." The first and second volume are devoted to polyacetylene and other conducting polymers respectively. Organic superconductors and related materials will be the subject of the papers contained in the third volume whereas the fourth one will be dealing with other charge transfer systems and metal-chain and organometallic conductors. The last volume will collect papers on transition metal chalcogenides and bronzes as well as on applications of synthetic metals.

We gratefully acknowledge the patronage of the International Union of Pure and Applied Chemistry (IUPAC) and of the European Physical Society (EPS) as well as the financial support by the: Italian National Research Council, University of Padova, Ente Nazionale Energie Alternative (ENEA), Ente Nazionale Energia Elettrica (ENEL), Ente Nazionale Idrocarburi (ENI), Magneti Marelli, Montedison, Olivetti, Pirelli, IBM of Italy, and Gordon and Breach Science Publishers.

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