

# The European Ceramic Society (ECerS)

Editorial Essay

By Rudi Metselaar \*

The European Ceramic Society was founded in 1987 as a federation of the ceramic societies of eleven European countries: Belgium, France, Federal Republic of Germany, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom, and Yugoslavia. Important goals of the Society are to improve mutual communication between ceramists within European countries, to maintain a calendar of meetings and to coordinate international meetings. Until now conferences were organized independently in different countries, sometimes leading to unfortunate timetable clashes. Now, meetings are planned by the ECerS, not only within Europe, but also on a global scale. Examples of topical meetings are the Conference on Ceramic Powder Processing Science organized in an alternating manner in Europe and the USA, and the Symposium on Ceramic Materials and Components for Engines organized in a similar way in Europe and Japan.

The need for a larger meeting covering the whole field of ceramics was also recognized. In June this year we organized the 1st Conference and Exhibition of the ECerS, in Maastricht, The Netherlands. It was the aim of this conference to bring together scientists, engineers and technicians with an interest in all fields of ceramics and this first conference was certainly a great success. A total number of 1400 participants and over 450 technical papers are clear evidence of the enthusiasm, and the interest from outside Europe was also great, 38 countries being represented. The papers presented covered basic science, engineering ceramics, bio-ceramics, electronic ceramics, and silicate ceramics and an exhibition of scientific equipment, raw materials and products was organized to run simultaneously. Special attention has been paid in order to make the Society and its activities attractive to young people. For example, student poster con-

tests have been organized for those having just finished their masters or Ph.D. degrees. It was decided to continue this series of conferences in 1991 under the direction of the new president of the Society, *Hans Hausner* (Berlin) in the Federal Republic of Germany and in 1993 in Spain. From then on the conference will probably be organized annually, although the presidency of the Society will continue to change hands (and country) every two years.

During the meeting in Maastricht another important achievement was announced. As a result of discussions between the ceramic societies of Europe, Australia, USA, China, Canada, Japan, South Africa, USSR and South America it was decided to establish a world federation under the name International Ceramic Federation. I will be the first president of the Federation, and Dr. *McLaren* of the American Ceramic Society will occupy the post of Secretary. The role that the Society played in the establishment of the ICF is clear evidence of the influence and strength of the European Ceramic Society. Another important development is the founding of the Society's new journal. The first issue of the *Journal of the European Ceramic Society* which is set up as a scientific journal with high standards appeared in June this year. Indeed, there has been a great need for such a journal in Europe, as until now, the results of European research in ceramic science and engineering have been scattered over many different journals. From now on it will be possible to present the European research effort in a coherent way. In view of the rapid developments in technical ceramics and the correspondingly strong competition, we consider this an important achievement. Readers of *Advanced Materials* may wonder if it is useful to start a discipline-oriented society at a time when everywhere else more general materials societies are being founded. The answer, in my opinion, is partly given above. Both the speed of the scientific and technological developments and the competitive nature of the materials industry produce the need for dedicated journals and specialist meetings.

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The future of ceramics in Europe requires a joint (international) effort. This does not mean that the ceramists want to stay in an isolated position and are not interested in developments in other fields of materials science. On the contrary, in some areas there is so much overlap of interests that a cooperation with for instance, metallurgists or polymer chemists is certainly necessary and fruitful. For ceramists this is not new, since ceramics has always been an interdisciplinary science practised by chemists, physicists and metallurgists and now, as a result, the European Society

is always open for discussions with other societies or for bilateral meetings.

In this respect cooperation in education should be encouraged in order that European materials science and technology will in the future hold a strong position in the world of advanced materials. The ECerS is ready to contribute and participate.

[1] For a Conference Report see R. J. Brook, *Adv. Mater.* 1989 No. 11; *Angew. Chem. Int. Ed. Engl. Adv. Mater.* 28 (1989) No. 11; *Angew. Chem. Adv. Mater.* 101 (1989) No. 11.

# Liquid Crystalline Elastomers

By Rudolf Zentel \*

**Crosslinkable Polymers  
Chiral Phases  
Piezo Electric Effects  
Mechanical Orientability  
Rubber-Like Elasticity**

Today, material science is directed towards the development of multifunctional and oriented structures. One example of such supramolecular systems are liquid crystalline (LC) elastomers which combine the properties of LC phases (the combination of order and mobility) with rubber elasticity, one of the most typical polymer properties. Their most outstanding characteristic is their mechanical orientability; strains as small as 20 % are enough to obtain a perfectly oriented LC monodomain. This orientability, if LC elastomers with chiral phases are used, leads, for example, to elastomers with chiral smectic C\* phases which are likely to show piezo-electric behavior.

## 1. Introduction

LC Phases combine the long range order of crystals with the mobility of liquids. Their formation from molecules with anisotropic forms, the so called "mesogenic" groups, has long been known for low molar mass compounds and structure-property relationships are well established.<sup>[1, 2]</sup> These LC Phases are thermodynamically stable phases that exist in a temperature range between the crystalline phase and the isotropic melt. For rod-like mesogenic groups, these phases can be subdivided into the nematic phase, for which the long range order is only caused by the — more or less — parallel orientation of the mesogenic groups, and into different smectic phases, in which the molecules are additionally arranged in layers. Different orientations of the mesogenic groups with respect to the layers, which can be perpendicular or tilted, are the basis for a further discrimination between smectic A and smectic C phases (Fig. 1). The transitions among the different phases can be detected by, for example,

differential scanning calorimetry (DSC) which measures the latent heat associated with the phase transitions. The most prominent property of these phases is their orientability in electric and magnetic fields.

LC Polymers<sup>[3-5]</sup> combine the self organization of the mesogenic groups into the ordered structure of LC phases with some typical polymer properties, such as the freezing of the disorder of the polymer chain at the glass transition temperature. Thus, in most cases, the LC phases also freeze glassy on cooling. In addition, an induced orientation can be frozen-in. LC Polymers can be prepared by incorporating the anisotropic mesogenic groups into polymeric systems. Three different ways (Fig. 2) to do this will be discussed, the first two of which are most commonly used. First, the mesogenic groups can be linked to the polymer chain as side groups, to produce LC side group polymers. Second, they

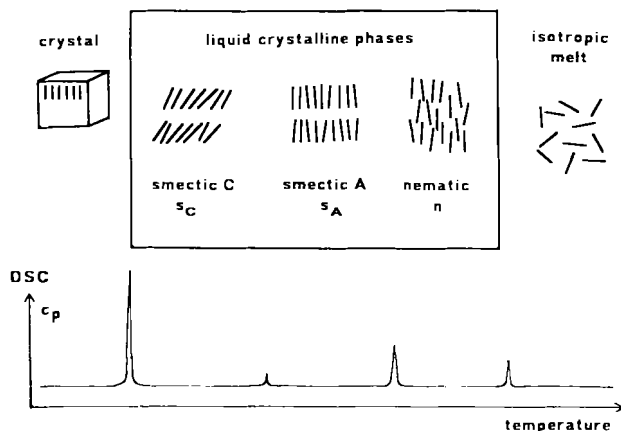


Fig. 1. Schematic representation of different LC phases that exist at temperatures between the crystalline and the isotropic phase. The transitions between these phases show up as peaks in Differential Scanning Calorimetry (DSC) measurements ( $C_p$  vs. temperature).

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