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## SUPERMOLECULAR STRUCTURE OF ORIENTED SEMICRYSTALLINE POLYMERS

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## 1. INTRODUCTION

In the 1960s the basis was laid for the experimental and analytical treatment of the orientation state of semicrystalline polymers in a series of papers.<sup>1-6</sup> In the following years a great number of single contributions were made detailing the relationships between structure formation, change of the orientation state and material properties.

In the middle of the 1970s the polymer-physical work began to turn from the description and the optimization of polymer production processes to a more systematic application of the principles of physical structure formation for the purpose of creating polymers with special properties.

Today the molecular as well as the supermolecular structures are manipulated so as to provide desired properties for very special applications. Examples of these new high performance polymers are high strength/high modulus fibers, conductive polymers and polymer ferroelectrics. It is characteristic for many of these to show special orientation states on which the properties depend. Consequently investigations of orientation effects are again finding a growing interest in polymer science. Texture investigations are becoming more and more an essential part of the methods of polymer characterization which are used to understand the relation between properties and structure as well as the processes of structure formation.

In this connection the complexity of structure formation in many cases requires particular efforts in structure characterization, such as the combination of different characterization techniques or *in-situ* investigations.

Beyond that, the characterization of oriented polymer materials continues to become more important as it becomes possible to achieve further progress in the properties of high performance polymers having a higher level of supermolecular organization. Thin polymer layers produced by the Langmuir-Blodgett technique, and, in the future, molecular electronic devices, can be regarded as examples of such materials. It is evident that the geometrical arrangement of the crystallites in low molecular weight polycrystalline materials has a significant