

Morphology Development of Polytetrafluoroethylene in a Polypropylene Melt (IUPAC Technical Report)

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Morphology development of polytetrafluoroethylene (PTFE) caused by applied flow history in molten isotactic polypropylene (PP) is investigated, employing a cone-and-plate rheometer and a capillary rheometer as mixing devices. Since the flow history is applied at 190 °C, PTFE is in the solid state whereas PP is in the molten state. It is found that primary PTFE particles tend to be agglomerated together by mechanical interlocking. Then they are fragmented into fibers by hydrodynamic force with reorganization process of crystalline phase. The diameter of the fragmented fibers is the same as that of the original ellipsoidal particles. Further, fine fibers whose diameter is in the range from 50 to 100 nm are also generated by yielding behavior of the particles. The prolonged shearing leads to a large number of fibers, although the diameter and length are hardly affected by the exposure time of shearing and shear stress. Moreover, the flow type (i.e., drag or pressure flow) does not affect the morphology to a great extent, although the drag flow is not efficient to reduce large agglomerated particles. The fibers form an interdigitated network structure, which is responsible for the marked melt elasticity.

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Definitions of Terms Relating to Crystalline Polymers (IUPAC Recommendations 2011)

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Recommendations are given concerning the terminology relating to the structure and the morphol-

ogy of crystalline polymers and the processes of polymer crystallization. They are applicable to cases where polymer crystals are a significant fraction of a system and primarily with crystal structures that are comprised of polymer chains with limited, static, or dynamic disorder. After some general definitions, terms pertaining to structural arrangements at sub-nanometric scales and to polymer crystal structures are defined. Terms relating to molecular conformation within polymer crystals, morphological aspects, and polymer crystallization are given in subsequent sections.

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Standards for Photoluminescence Quantum Yield Measurements in Solution (IUPAC Technical Report)

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For any photoluminescent species, the quantum yield (QY) of its luminescence is a basic property, and its measurement is an important step in the characterization of the species. According to the definition of the QY, only two quantities need to be known, viz. the number of photons absorbed and the number of photons emitted per unit of time. Unfortunately, reliable measurements of these quantities can be hard to obtain. In this paper, the use of standards for the measurement of photoluminescence QYs in dilute solutions is reviewed. Only three standards can be considered well established. Another group of six standards has been investigated by several independent researchers. A large group of standards is frequently used in recent literature, but the validity of these is less certain. The needs for future development comprise: (i) confirmation of the validity of the QY values of many commonly used standard materials, preferably in the form of SI traceable standards; (ii) extension of the set of standard materials to the UV and near-IR spectral ranges; and (iii) good standards or robust protocols for the measurements of low QYs.

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