Rigid Amorphous Fraction of Semicrystalline Polymers and Polymer Nanocomposites

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For semicrystalline polymers, the observed relaxation strength at glass transition is often significantly smaller than expected from the non-crystalline fraction. This observation leads to the introduction of a rigid amorphous fraction (RAF) which does not contribute to the heat of fusion or X-ray crystallinity, nor to the relaxation strength at glass transition. The RAF is non-crystalline and in a glassy state above the common glass transition temperature.

From heat capacity, the temperature and time dependence of the RAF can be obtained. For PC, PHB, and sPP, it is possible to study the creation and disappearance of the RAF in situ during isothermal crystallization and during stepwise melting.

A RAF can be detected for polymer nanocomposites as well. The amount and thermal stability of the RAF in such systems, which is important for solubility and degradation considerations, will be discussed.