

Abstract Submitted
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Melting Point Depression of Small Molecules in Cross-linked and Uncross-linked Polyisoprene: Deviations from Flory-Huggins Theory¹

QIAN QIN, GREGORY MCKENNA, Texas Tech University — Thermoporosimetry (TPY) is becoming increasingly used to study nano-scale heterogeneity in polymers. The starting point for TPY is the Gibbs-Thomson (GT) relation between melting point and inverse crystal size. In the case of polymers, the Flory-Huggins (FH) model predicts that there is a depression of melting point due to the mixing of the polymer and the solvent molecules, and this needs to be taken into account. The first step in analysis of heterogeneity size using TPY and the GT equation requires that there be quantitative agreement between FH and the melting points in the uncross-linked rubber. We find that both benzene and hexadecane exhibit excessive melting point depressions in uncross-linked polyisoprene. This may imply that the uncross-linked polymer is divided into ‘nanoheterogeneities.’ We further find that the heat of fusion decreases as polymer concentration increases for the benzene, but not for the hexadecane. To our knowledge this is the first systematic investigation of the validity of melting of small organics in un-cross-linked polymers using the FH expressions.

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