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Solid State Charge Transport in Radical Polymers LIZBETH ROSTRO, BRYAN BOUDOURIS, School of Chemical Engineering, Purdue University — Organic electronic devices based on π-conjugated polymers have attracted increasing attention over the past decades; however, many important synthetic and structural issues (*e.g.*, uncontrolled polymerization schemes, the presence of residual metal catalysts) currently stymie the ability of these materials to replace traditional inorganic electronic materials. Here, we present the controlled and impurity-free synthesis of a fundamentally new type of charge-conducting polymer in which a pendant stable radical group on each repeat unit allows for charge transport (*i.e.*, radical polymers). Specifically, these molecules were synthesized using controlled radical polymerization techniques such that well-defined and easily tunable molecular weights and narrow molecular weight distributions could be had without the use of metal-based catalysts. Additionally, for the first time, we systematically characterize the charge transport ability of radical polymers and the effect of molecular weight on the transport properties of a model radical polymer, poly(2,2,6,6-tetramethylpiperidinyloxymethacrylate). Furthermore, we have utilized temperature-dependent transport measurements in order to suggest a mechanism for carrier transport in this emerging class of optoelectronically-active polymers.

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