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Small Molecule Doping of Radical Polymers for Enhanced Electronic Performance ADITYA BARADWAJ, SI HUI WONG, BRYAN BOUDOURIS, Purdue University — Radical polymers have emerged as a class of conducting polymers that show immense potential for solid state electronic applications. However, very little has been done to explore the small molecule doping of these materials for increased electrical performance. Here, we present the characterization of the charge transport ability of a model radical polymer, poly(2,2,6,6-tetramethylpiperidinyloxy methacrylate) (PTMA), doped with varying levels of the small molecule, 4-Acetamido-2,2,6,6-tetramethyl-1-oxopiperidinium tetrafluoroborate (TEMPOnium). We demonstrate that the addition of the TEMPOnium to PTMA thin films creates a distinct relationship between doping level and electrical conductivity. At optimal doping levels, we find that the electrical conductivity of PTMA thin films increases by over an order of magnitude. Furthermore, we illustrate the competing effects of electrical and ionic conductivity that exists in this system by probing the dependence of current on time in these thin films. Finally, we show that the TEMPOnium doping greatly enhances the film quality of these typically brittle PTMA thin films. We anticipate that these findings will encourage novel methods to enhance the electrical performance of these open shell systems in the solid state.

Aditya Baradwaj
Purdue University

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