

# **Synthesis and Characterization of Phosphorus Containing Poly(arylene ether)s**

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(ABSTRACT)

The synthesis and characterization of phosphorus containing poly(arylene ether)s were investigated to determine the effect of phosphorus upon the thermal stability, mechanical strength, and fire resistance of thermoplastics. Phosphorus containing activated aromatic dihalides and bisphenols were synthesized in high purity. These monomers were successfully polymerized *via* nucleophilic aromatic substitution to afford high molecular weight polymers. It was determined that by incorporating the phosphine oxide moiety into the polymer backbone certain properties of the resulting poly(arylene ether)s were substantially improved, such as an increase in  $T_g$ , thermal stability in air, modulus, and char yield, compared with control poly(arylene ether sulfone)s. The high char yields obtained for these polymers in air, along with observed intumescence indicates that these materials have improved fire resistance. Preliminary cone calorimetry measurements support this conclusion.

In addition, the phosphine oxide group in the backbone was reduced to a phosphine and successfully converted to a phosphonium bromide ionomer. The resulting system was further chemically modified to ionically bond second-order nonlinear optical chromophores to the backbone of selected poly(arylene ether)s. Initial results on corona poling of cast film at low temperature produced stable second harmonic generation in these materials, indicating that they may have promise in nonlinear optical applications.

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