

Synthesis of Aromatic Poly(ether ketone)s Containing C36 Aliphatic Unsaturated Groups in the Main Chain

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ABSTRACT: Aromatic poly(ether ketone)s (PEKs) were modified with various amount of C36 dimer acid Pripol 1017 obtained from polymerization of unsaturated C18 fatty acids. To obtain modified PEKs, polycondensation was carried out using various dicarboxylic acids with diphenylether at 75°C in phosphorus pentoxide/methanesulfonic acid as condensing agent and solvent. The reduced viscosities of polymers are relatively low, up to 0.13 dL/g. PEK with a structure (molar ratio of aliphatic to aromatic segment : 0.33) is soluble in organic polar solvents and can be cast from a tetrahydrofuran solution with cobalt naphthenate air dryer in order to obtain crosslinked film at room temperature. © 1997 John Wiley & Sons, Inc. *J Appl Polym Sci* **63**: 1275–1278, 1997

Key words: aromatic poly(ether ketone); C36 aliphatic unsaturated group

INTRODUCTION

Since poly(aryl ether ketone) (PAEK) has shown promise as an excellent engineering plastic due to its good mechanical and thermooxidative stability, the synthesis of aromatic poly(ether ketone)s (PEKs) has been of interest in recent years.¹

A number of synthetic routes for producing PEKs have already been described in the literature.¹ PEKs can be prepared by means of two procedures: (i) by nucleophilic substitution and (ii) by electrophilic substitution reactions. In the latter method, polycondensation has been carried out by Friedel–Crafts acylation. In this manner a number of Friedel–Crafts catalysts have been used. HF/BF₃, strong acids such as trifluoromethanesulfonic acid,³ and combination of methanesulfonic acid/P₂O₅⁴ are useful catalysts as well as solvents for electrophilic substitution.

Although PAEKs are opaque, tough engineering thermoplastics showing excellent high temperature and hydrolytic, chemical, solvent,

and stress-crack resistance, they have some drawbacks: relatively lower glass transition temperature (T_g) compared with aromatic poly(ether sulfone), the necessity of high temperature to fabricate parts, insolubility in typical organic solvents, and others. From this point of view, the most structural modifications have been achieved to improve the properties of PAEK for various applications and different purposes. The first method in the modification of PAEK has involved structural changes in the main chain, such as the introduction of various groups along the chain, e.g., alkyl,⁵ —SO₂—,⁶ —CF₃, Si—O—Si,⁸ amide,⁹ imide,¹⁰ heterocycles,^{11,12} phosphorus,^{13,14} and biphenyl groups,¹⁵ variation of meta-to-para ratio,⁴ and variation of ether-to-ketone ratio.¹⁶ The second method for the modification of PAEK is to introduce pendent groups into the polymer chain. PAEK-type polymers with sulfonylchloride,¹⁷ sulfonamide,¹⁷ methyl,¹⁸ bromomethyl,¹⁹ phenyl,²⁰ ethynyl,²¹ and long alkyl chain substituents²² were prepared. An alternative approach to the modification of PAEK was achieved to introduce amino²³ and ethynyl²⁴ groups into the polymer terminal for further purposes.

From this point of view, we are interested in

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