

Synthesis and Characterization of Soluble Reactive Copoly (aryl ether ketone ketone)

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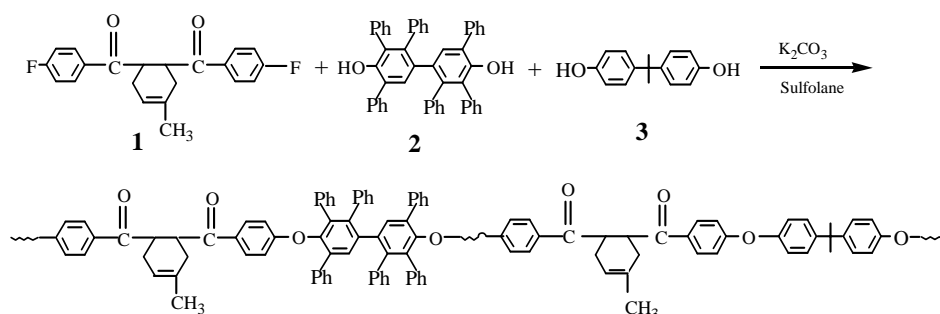
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Abstract: Soluble reactive copoly (aryl ether ketone ketone) was synthesized from the condensation of 2,2',3,3',6,6'-hexaphenyl-4,4'-diphenol, 2,2-*p*-hydroxyphenyl-*iso*-propane, and 1-methyl-cyclohex-1-ene-4,5-diyl-bis (4-fluorophenyl methanone). FT-IR, DSC and TGA were used to characterize the novel polymer.

Keywords: Poly(aryl ether ketone ketone), synthesis, solubility.

Poly (aryl ether ketone)s are a category of high performance engineering plastics, widely used in electronic, electric, and military industries¹. For their general excellent properties, many new products are developed. In recent years, much attention has been paid to synthesize soluble or reactive poly (aryl ether ketone)^{2,3}. In this letter, we report the synthesis of a novel soluble reactive copoly (aryl ether ketone ketone) from 2,2-*p*-hydroxyphenyl-*iso*-propane **3**, functionalized chemical **1**, and polysubstituted diphenol **2** as shown in **Scheme 1**.

Scheme 1



1 was synthesized according to reference 4 except fluorobenzene was used instead of chlorobenzene, and the preparation of **2** followed the procedure described by Hay⁵. Structures of these two monomers were confirmed with ¹H-NMR and FT-IR analysis. The polycondensation was carried out in sulfolane at 200 °C under N₂ atmosphere for 8 h. Experimental results showed that under these reaction conditions, only low viscosity polymer was obtained with **1** and **2**. This is due to the low reactivity of **2** caused by its

hindered phenyl substitutes. Well, the polycondensation of **1** and **3** yielded poly (aryl ether ketone ketone) with intrinsic viscosity of 0.59 dL/g in CHCl₃ at 25°C. However, in this case, sometimes portion of polymer appeared as gel. When the usage of 1-methyl-cyclohex-1-ene-4,5-diyl-bis (4-fluorophenyl methanone) **1**, 2,2',3,3',6,6'-hexa phenyl-4,4'-diphenol **2**, and 2,2-*p*-hydroxyphenyl-*iso*-propane **3** were in a ratio of 2:1:1 (molar ratio), the obtained polymer with intrinsic viscosity of 0.29 dL/g in CHCl₃ at 25°C was absolutely soluble. The double bonds along the polymer chain made it reactive because reaction could take place on double bonds with other chemicals such as halogen, hydrogen halide and oxygen. The copoly (aryl ether ketone ketone) was characterized with FT-IR, DSC and TG analysis. The FT-IR spectrum showed the presence of the strong absorption of carbonyl group at 1665 cm⁻¹, CH₃ at 2924-2966 cm⁻¹, and C-O-C at 1237 cm⁻¹. DSC analysis showed the copolymer has only a single glass transition temperature of 210°C. This confirmed that the product is a copolymer but not a mixture of two homopolymers. The 5% weight loss temperature is above 400°C. Furthermore, the copolymer has good solubility in many kinds of organic solvents such as CHCl₃, DMAc, sulfolane, chlorobenzene and NMP.

Acknowledgments

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