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Thermal degradation of dianhydride-modified polybenzoxazine

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Bisphenol-A/aniline based polybenzoxazine (abbreviated as poly(BA-a)) modified with different types of dianhydride, i.e. benzophenone-3,3',4,4'-tetracarboxylic dianhydride (BTDA) and pyromellitic dianhydride (PMDA) is attractive for the applications that require high thermal and mechanical properties with fire resistant characteristics. Therefore, thermal stability and thermal degradation kinetics may be significant to production and application. The purpose of the present work is to investigate the changes that take place during the thermal degradation of the poly(BA-a)/BTDA and the poly(BA-a)/PMDA copolymers. The activation energy and the reaction mechanism of the degradation processes of the copolymers presented by thermogravimetric analysis under argon atmosphere were estimated from non-isothermal kinetic results. The derivative thermogravimetric analysis (DTG) thermograms of the poly(BA-a)/BTDA copolymer exhibited five stages of thermal degradation reaction, while the four stages of thermal degradation reaction of the poly(BA-a)/PMDA copolymer were observed. The activation energy values obtained by composite kinetic method of five stages for the poly(BA-a)/BTDA copolymer and four stages for the poly(BA-a)/PMDA copolymer are 135-284 kJ/mol and 131-240 kJ/mol, respectively. Furthermore, the degradation reaction mechanism by integral master plot method of the stages of the poly(BA-a)/BTDA and the poly(BA-a)/PMDA copolymers was accounted by random nucleation model with one nucleus on the individual particle (F1)

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