عنوان مقاله:

Kinetics of thermal degradation of PMMA-based dental resins scraps

محل انتشار:

نشریه آسیایی شیمی سبز, دوره 4, شماره 2 (سال: 1399)

تعداد صفحات اصل مقاله: 18

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خلاصه مقاله:

In this work, the cross-linked PPMA-based dental resins scraps were applied to pyrolysis to recover MMA (Methyl methacrylate). Thermal degradation of the cross-linked PPMA-based dental resins scraps was analyzed using TG/DTG to guide the operating condition. The pyrolysis was carried out in a reactor of 143 L, at 345 °C and 1.0 atmosphere. The reaction liquid products which were obtained at 30, 40, 50, 60, 70, 80, and 110 min, were physicochemically characterized for density, kinematic viscosity, and refractive index. The chemical composition of the reaction liquid products, obtained at 30, 40, 50, 60, 70, 80, and 110 min, was determined by GC-MS. The liquid phase yield was 55.50% (wt), while that of the gas phase was 31.69% (wt). The density, kinematic viscosity and refractive index of the reaction liquid products which were obtained at 30, 40, 50, 60, 70, 80, and 110 min, varied between 0.9227 and 0.9380 g/mL, 0.566 and 0.588 mm2/s, and 1.401 and 1.414, respectively. Moreover, it shows the percentage errors at the range of 0.74-2.36%, 7.40-10.86%, and 0.00-0.92%, respectively, as compared to the standard values for density, kinematic viscosity, and refractive index of pure MMA (Methyl metaclylate) at 20 °C. The GC-MS, identified in the reaction liquid products during pyrolysis, esters of carboxylic acids, alcohols, ketones, and aromatics, shows concentrations of MMA (Methyl metaclylate) between 88.003 and 98.975% (Area). The concentrations of MMA (Methyl metaclylate) in the liquid phase, between 30 and 80 min, reach purities above 98% (Area), decreasing drastically with increasing the reaction time after 100 min. Thus, it will be possible to depolymerize the cross-linked PPMA-based dental resins scraps by pyrolysis in order to recover MMA (Methyl methaclylate).

کلمات کلیدی:

PMMA, Pyrolysis, Process Analysis, Kinetics, Recovery of MMA