

论文

超支化聚氨酯阻尼涂层的制备及性能

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摘要:

以甲苯-2,4-二异氰酸酯(TDI)和二乙醇胺(DEOA)为原料, 采用一步法合成了超支化聚氨酯, 并对其改性制备了光固化超支化聚氨酯(UV-HPU)和超支化杂化聚氨酯(HHPU)两种树脂. 用傅里叶红外光谱(FTIR)和核磁共振氢谱(¹H NMR)表征了预期产物. 以其为预聚物制备阻尼涂层, 动态力学分析(DMA)研究表明, 这两种涂层都具有高阻尼因子(tanδ≥1.0)、宽阻尼温度范围(tanδ≥0.5, 大于50 °C)和宽阻尼频率范围(20~160 Hz); 通过基本性能测试和热重分析(TGA)发现杂化涂层聚氨酯较光固化聚氨酯具有更好的机械性能和热稳定性; 杂化涂层聚氨酯的FTIR分析可知杂化涂层中硅氧烷水解缩合, 提高了交联密度; 杂化材料的断面扫描电镜(SEM)分析表明, 硅氧烷的水解缩合并未形成大颗粒纳米粒子而是形成均相体系.

关键词: 超支化聚氨酯 阻尼涂层 水解缩合

Synthesis and Properties of Damping Coating Based on Hyperbranched Polyurethane

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Abstract:

Hyperbranched polyurethane(HPU) was synthesized from toluene-2,4-diisocyanate(TDI) and diethanolamine(DEOA) by one-step method, which was further modified to prepare UV-curable hyperbranched polyurethane(UV-HPU) and hyperbranched hybrid polyurethane(HHPU). The resins were characterized by Fourier-transformed infrared spectroscopy(FTIR) and ¹H nuclear magnetic resonance (¹H NMR). The results indicate the successful synthesis of the production. Then the resins were used as oligomers to prepare damping coatings. Dynamic mechanical analysis(DMA) results show that the two cured resins of UV-HPU and HHPU have a high loss tangent(tanδ≥1.0), wide ranges of temperature (tanδ≥0.5, 50 °C) and wide ranges of frequency(20-160 Hz). Thermal gravimetric analysis(TGA) results indicate that HHPU coatings have a higher thermal stability than UV-HPU coatings. The FTIR of the hybrid coatings indicate the hydrolysis and condensation of trimethoxysilane. The Scanning electron microscopy (SEM) photographs of fracture surface of the hybrid material show that the hybrid material presents homogeneous system without obvious inorganic particle forming.

Keywords: Hyperbranched polyurethane Damping coating Hydrolysis and condensation

收稿日期 2008-04-14 修回日期 1900-01-01 网络版发布日期

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