

论文

助溶剂驱使溶胶-凝胶化SiO₂/聚丙烯酸酯复合涂层

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摘要:

采用助溶剂和硅烷偶联剂(Z26040)对碱性硅溶胶进行复合改性后添加到聚丙烯酸酯乳液中制备SiO₂/聚丙烯酸酯杂合乳液(Si/PAE),分别考查助溶剂的种类和用量对硅溶胶的溶胶-凝胶化(sol-gel)反应及复合涂层综合性能的影响,结果发现:异丙醇是合适的助溶剂,其最佳添加量为硅溶胶质量的10%。TEM测试和纳米粒径分析发现:助溶剂可以提高无机硅颗粒在杂合乳液中的分散能力,降低Si/PAE的平均粒径。傅里叶红外光谱(FTIR)和原子力显微镜(AFM)分析说明:Si/PAE乳液在成膜过程中,助溶剂可驱使硅溶胶发生sol-gel反应,并在涂层表面富集含硅聚合物,Si/PAE的涂层结构平整且致密。TGA分析发现:Si/PAE涂层具有较好的热稳定性。

关键词: SiO₂/聚丙烯酸酯杂合乳液 溶胶-凝胶化 硅烷偶联剂 助溶剂

Co-solvents induced sol - gel-derived SiO₂/polyacrylate composite films

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Abstract:

SiO₂/polyacrylate composite emulsions (Si/PAE) were prepared by polyacrylate emulsions (PAE) mixing with alkaline silica sol modified by a saline coupling agent and a co-solvent. The effects of kinds and amounts of co-solvent s on the sol-gel reaction and the properties of composite films were investigated. The results indicate that isopropanol is the best co-solvent and the optimal dosage is 10 wt% of the silica sol. The nano-granularity analysis and TEM photos show that co-solvents can make the silica particles distribute more evenly in the composite emulsions and reduce the average diameters of the Si/PAE. The FTIR spectra and AFM pictures indicate that co-solvents could induce the occurrence of sol-gel reaction of silica sol to form Si-based polymers on the surface of films during the film formation. Si/PAE films display excellent properties besides high gloss and compact. TGA curves indicate that the Si/PAE films exhibit higher thermal stability than PAE.

Keywords: SiO₂/polyacrylate composite emulsions sol-gel process silica coupling agent co-solvent

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