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论文

# 助溶剂驱使溶胶- 凝胶化$SiO_2$/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$SiO_2$/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 $SiO_2$/polyacrylate composite films

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Abstract:

$SiO_2$/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: $SiO_2$/polyacrylate composite emulsions sol-gel process silica coupling agent co-solvent

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