

## **Effects of Silica Based Fillers, Surface Treatment and Curing Method on Mechanical Properties of Silica/Unsaturated Polyester Composites**

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**Source:** MACROMOLECULAR RESEARCH **Volume:** 18 **Issue:** 4 **Pages:** 372-379 **DOI:** 10.1007/s13233-010-0409-0 **Published:** APR 2010

**Abstract:** This study examined the effects of silica based fillers, precipitated silica (PSi) and silica from fly ash (FASi), and a silane treatment on the mechanical and morphological properties of unsaturated polyester (UPE) resins cured by conventional thermal (CV) and microwave (MW) curing methods. The curing curves for unfilled UPE in both curing systems exhibited S-shaped character. The curing curves for PSi/UPE composites were different from those of the FASi/UPE composites due to differences in the number of hydroxyl groups on the silica surfaces. MW curing could reduce the curing time in a greater magnitude than CV curing, suggesting that microwaves are more suitable for curing polymers containing silica based fillers. The percentage conversion of silica/UPE composites increased with increasing filler content. The flexural modulus, hardness and impact strength increased with increasing filler content for both silica fillers. The presence of silica filler in the UPE resulted in a sudden decrease in flexural strength, even though the strength improved slightly with increasing silica content. The overall mechanical properties of the UPE composites were improved considerably using 3-glycidoxypropyl trimethoxysilane (KBM-403) on a silica surface.

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