

Performance of Melamine Modified Urea-Formaldehyde Microcapsules in a Dental Host Material

Abstract

Urea–formaldehyde (UF) microcapsules filled with dicyclopentadiene (DCPD) show potential for making self-healing dental restorative materials. To enhance the physical properties of the capsules, the urea was partially replaced with 0–5% melamine. The microcapsules were analyzed by different microscopic techniques. DSC was used to examine the capsule shell, and the core content was confirmed by ^1H NMR spectroscopy. Capsules in the range of 50–300 μm were then embedded in a dental composite matrix consisting of bisphenol-A-glycidyl dimethacrylate (Bis-GMA) and triethylene-glycol dimethacrylate (TEGDMA). Flexural strength, microhardness, and nanoindentation hardness measurements were performed on the light-cured specimens. Optical microscopy (OM) examination showed a random distribution of the microspheres throughout the host material. The incorporation of small amounts of the microcapsules did not affect the performance of the matrix material. Scanning electron microscopy (SEM) analysis revealed excellent bonding of the microcapsules to the host material which is a characteristic of utter importance for maintaining the very good mechanical properties of a dental composite with self-healing ability. © 2011 Wiley Periodicals, Inc. *J Appl Polym Sci*, 2011.

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