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Self-strengthening dental adhesive: Mechanism and long-term behaviour

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The degradation of methacrylate-based dental adhesives via chemical and enzymatic hydrolysis leads to destruction of the integrity of the dentin/adhesive interface, loss of bond strength and failure of the composite restoration. Self-strengthening methacrylate-based adhesive systems were developed by introducing visible-light irradiation induced (photoacid-induced) sol-gel reaction. The self-strengthening mechanism and mechanical properties of copolymers were investigated by real-time Fourier transform infrared spectroscopy (FTIR) and dynamic mechanical analyzer (DMA), respectively. HPLC was used to determine cumulative amount of leached species. Time-temperature superposition (TTS) was employed to predict the long-term performance. The results indicated that with the incorporation of organosilane components, self-strengthening adhesives showed 1) significantly reduced leachable species (HEMA and BisGMA); 2) gradual increase in mechanical properties under wet conditions (neutral or acidic pH); 3) better long-term behavior predicted by TTS. In conclusion, the mechanical properties of this resin are reminiscent of living organisms such as marine invertebrates. These results provide valuable information for the development of dental adhesives with enhanced durability.

Biography

Linyong Song is Ph.D. is in Polymer Chemistry from the University of Science and Technology of China. He received his B.S. from Tianjin University in Polymer Engineering. His main area of interest is Biomaterials, Interfacial Polymerization, Synthesis of Functional Monomers, Micro/Nano Structure Materials.

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