ADA Science & Research Institute

Stable Dental Resins

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Inventors

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Background

Current dental resin composites last, on average, about 7 years due to fracture and secondary caries caused by materials degradation and micro-leakage. Polymerization shrinkage and stress cause micro-leakage at the tooth interface leading to restoration failure. The ester bonds present in these materials are also hydrolyzable and can be broken down by cariogenic bacteria, acid, base, and enzymes that are present in the oral cavity. This can result in the formation of secondary caries. Furthermore, leachability of unreacted monomers and degradation by-products such as bisphenol (BPA) derivatives can occur.

Invention Description

ADA researchers have developed enzymatically and hydrolytically stable resins, resin monomers. and resin composites. This has been achieved by developing materials where the hydrolyzable ester groups have been replaced with ether groups. The compositions are stable against environmental challenges, such as hydrolysis, enzymatic degradation, and bacterial challenges. These ether-based resins are also co-polymerizable with conventional methacrylate resins, while maintaining improved stability compared to traditional materials such as bisphenol A glycidyl dimethacrylate/triethylene glycol dimethacrylate (Bis-GMA/TEGDMA). Additionally, co-polymerization produces materials with a high degree of vinyl conversion and clinically relevant photocuring times. Furthermore, at equivalent levels of vinyl conversion, the new composites generate less stress than those based on Bis-GMA/TEGDMA.

Intellectual Property Status:

US Patents Issued:
US 9,150,666 B2,
US 9,572,753 B2,
US 10,231,906 B2,
US 10,675,224 B2,
US 10,966,909 B2,
US 10,246,540 B2 &
US 10,730,982 B2

Potential Applications

- Improved (longer-lasting) dental resin composites

Benefits and Advantages

- Improved stability to environmental challenges such as
  - Hydrolysis
  - Enzymatic degradation
  - Bacterial challenges
- Co-polymerization allows clinically relevant photocuring times
- High degree of vinyl conversion with reduced stress compared to traditional materials
- Mechanical properties are comparable with existing commercial composites

Contact

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