Compositions and Methods for Bioactive Dental Composites

Dental Composites have been used for many decades for dental/enamel restoration. Recent data suggests there is a high failure rate in these restorations leading to eventual, costly replacements.

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Inventors
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Benefits / Features
-Less Degradation but keeps the major benefits from BisGMA and TEGDMA
-Prolonged Lifespan
-Improved Bioactivity
-Enhanced Remineralization
-No Thiol or Amide's
-Reduced Gap Formation

Potential Commercial Applications
Filling for dental cavities.

Stage of Development
Early

Status
Seeking research collaboration & licensing partners

Background

The use of dentin/enamel bonding agents has become increasingly popular within the last few years. Unfortunately, due to the lack of stability among the covalent bonds within the polymeric matrix; greater than 50% of dental restorations have been failing within the past 10 years. The current tooth-colored resin composites have a short lifespan leading to early failure and have the potential to release toxic compounds into the mouth. The major reasons for the early failure may be attributed to the degradation of the polymer matrix and the coupling agent along with the formation of gaps due to polymerization shrinkage. The result of early failure results in increased replacement costs for the patient.
The dental composites are comprised of the following components: an initiator, polymeric matrix, filler, and coupling agent. The composites which are mainly in the market consist of BisGMA, UDMA, and TEGDMA.

Description of Technology

There are ester bonds within the polymeric matrix and the coupling agents. These bonds have been degrading rapidly, leading to a collapse of the polymer backbone resulting in decrease in mechanical strength and early failure of the dental composite. Unlike other scientists who are straight developing amide or using thiol-ene click chemistry to simply reduce degradation and shrinkage, the keys of this technology are (1) to alter the chemical structure to REDUCE THE ADVERSE IMPACT of degradation, (2) to eliminate the gap by design of special mineralizing components. First, Dr. Wang has developed hydrolytically stable resins, which will not collapse the polymer matrix, but also still keep similar benefits as that for BisGMA (such as mechanical strength, viscosity, polymerization conversion, etc). In the meantime, he has also developed bioactive fillers as well as new coupling agents specifically for this bioactive filler. This composite is not only bioactive, but can also enhance the remineralization process, reducing the gap between materials and tooth. These new dental composites have shown to have a low rate of degradation, long service life time, high bioactive property, re-mineralizing potential, and self-healing capability. The end result being effective restoration avoiding unnecessary, expensive replacement.

Opportunity

Howard University and Dr. Wang are seeking partners for licensing and collaboration opportunities. Dr. Wang is available for further discussions about technical details and project status under a NDA.