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Dental Releasing Materials

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Background

Resin composites are popular materials to fill tooth cavities due to their esthetics and direct-filling capabilities. However, the materials are susceptible to micro-cracking brought on by thermal and mechanical stresses resulting from strong occlusal (chewing and clenching) forces. These micro-cracks can result in secondary caries formation and bulk fracture of the composite materials, limiting the service lifetime of dental restorations. Repair usually requires complete replacement of the resin filler material. While calcium and phosphate-releasing composites have been developed to mitigate caries formation, such materials typically have low mechanical strengths. There is therefore continued interest in developing composites capable of reducing caries formation, while simultaneously providing improved mechanical strength.

Invention Description

ADA researchers have developed new dental restorative composites that contain nano-sized calcium phosphate fillers and/or fluoride releasing fillers for substantial calcium and phosphate ion release and/or fluoride ion release, together with reinforcement fillers, allowing the mechanical properties to meet or exceed the values for commercial non-releasing, stress-bearing composites. These new nano-composites provide the needed combination of stress-bearing and caries-inhibiting capabilities. The filler content is readily adjustable, allowing use in different dental materials and applications.

Potential Applications

The compositions of the present invention can be tailored for applications as:

- Stress-bearing and caries-inhibiting dental restorative composites
- Cavity liners and sealers
- Adhesive and bonding agents
- Cements for crowns and orthodontic brackets

Benefits and Advantages

- Mechanical properties are comparable or superior to those for commercial non-releasing, stress-bearing composites (flexural strengths up to 170MPa, fracture toughness > 1 MPa·m^{1/2})
- Provides requisite calcium and phosphate ion release levels for remineralization.
- Tailorable filler content allows use in multiple dental materials and applications.