UNIVERSITY OF LIMERICK
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Technology Transfer Office

Licensing Opportunity

A Glass Ionomer Cement

Overview

Glass ionomer cements (GICs) are currently used in orthopaedic and dental fields. GICs are formed from two materials, that are mixed to form a paste. The paste is applied to bone or teeth and hardens quickly to form a cement. They are often used as dental sealants, fillings, and as orthodontic brackets. Advantages to the use of GIC is that they are water-based and have the ability to chemically bond to both dentin and bone and can release therapeutic ions such as fluoride. When used in dental applications fluoride release can prevent enamel demineralization and promote remineralization.

Limitations on the use of GIC's are that they can be brittle material, with poor mechanical strength in terms of fracture toughness, when compared to bone and teeth. For instance, in dental applications, wear rate is a problem in relation to fracture toughness, toughness, and flexural strength. The formulation of the two materials that are mixed to form the cement can also put limits on either the mechanical strength of the cement or on the handling and placement of the cement i.e., how quickly it hardens. If the paste hardens too quickly the operator has a relatively short time during which to insert and manipulate the cement into a bone or dental cavity. The rheology and viscosity of GIC cement pastes also present handling difficulties for the operator.

Technology

The current invention used cement modifiers that alter the setting time of the cement and can increase the mechanical toughness of the GICs. By adding two different categories of modifiers, individually or in combination, the polymer network of the cement can be modified to overcome the constraints presented by currently available GICs.

Two categories of cement modifier can be used, the first category creates chemical linkages, and have a functional group (oxirane rings, amines, and/or carbodiimides). The second category act as dispersion additives or plasticizers. Some chemical compounds may fall into both categories of cement modifiers (chemical and dispersive additives).
Using these cement modifiers, the mechanical properties of GICs can be significantly improved; toughness (1500% increase), fracture toughness (135% increase), and Young's modulus (38% increase). GICs made in this manner are more suitable for use in load-bearing situations in both dental and orthopaedic fields.

Benefits

The addition of the cement modifiers can change the behaviour of the cement in the paste development, setting and maturation stages of the setting reaction. They can also improve the mechanical toughness of the GIC. The use of modifiers allows the properties of conventional GICs to be tailored for applications and extends the uses of GICs in both dental and orthopaedic applications. e.g., class II restorations, and cranial bone cement.

- Extends the setting time of the cement
- Improves mechanical properties such as toughness, fracture toughness and Young's modulus
- Improved rheological properties for handling

Applications

Dental and orthopaedic applications, to include load bearing applications and potential for use in Class II restorations and as cranial cement.

Commercial Opportunity

The University of Limerick is seeking partners to exploit the commercial potential of these technologies by entering into licensing agreements.

☐ Development partner

☒ Commercial partner

☒ Licensing

☒ University spin-out

☐ Seeking investment

Patent Filings:

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