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## Enhancing Dentin Bonding Durability Using Quaternary Pyridinium Salts

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### Background

Adhesive dentistry is based on the development of materials which establish an effective bond with the tooth tissues. Successful adhesive bonding depends on the chemistry of the adhesive, on appropriate clinical handling of the material as well as on the knowledge of the morphological changes caused on dental tissue by different bonding procedures. One of the major reasons for short service life of dental restoratives is the bonding failure within the adhesive layer. There is therefore interest in providing improved adhesives and resins to improve the service life of dental restoratives.

### Invention Description

ADASRI researchers have developed additives for dental restorative materials that enhance their stability and their dentin bonding durability. The additives are quaternary pyridinium salts that, when added to the dental materials at levels between about 0.1 and 1.25 wt%, have been found to increase at least one of the following: (i) the stability of dental resins and adhesives against enzymatic challenge, (ii) the bonding durability with dentin and/or (iii) the degree of conversion in polymerization. Superior stability results have been obtained for use of the additives with 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> generation dental adhesives, without compromising their bonding strength.

### Potential Applications

The materials of the present invention may be used as additives to improve the performance of:

- Dental adhesives
- Dental resins

### Benefits and Advantages

- Additives increase or maintain the degree of conversion in polymerization
- Increased crosslink density within the polymer (i.e. denser crosslinking) leads to enhanced stability
- Increased stability to enzymatic challenge: erosion measurements under enzymatic challenge yield a 3X reduction in the erosion depth
- Improved durability – microtensile bond strength remains unaffected for at least 10,000 thermal cycles