

RTI Prominent Publications Summary

Surface Modification for Enhanced Silanation of Zirconia Ceramics

Piasecik, J.R., Swift, E.J., Thompson, J.Y., **Grego, S., & Stoner, B.R.** (2009). Surface modification for enhanced silanation of zirconia ceramics. *Dental Materials* 25 (9):1116-1121.

Over the past 15 years, developments in biomedical dental materials have generated interest in high-strength ceramics, specifically zirconia. These ceramics offer a significant increase in mechanical performance over silica-based materials—porcelains—which have been used for decades. However, conventional adhesion techniques do not work when using zirconia as a restorative replacement. Zirconia is attractive as a biomaterial because it is chemically inert, but this attribute makes it difficult to reliably adhere to dentin, the underlying substrate. Research has focused on developing novel ways to find a dependable solution for long-term restorative efficacy, such as chemically modifying the surface of zirconia dental ceramics with a silica seed layer to increase adhesive bonding with commercially available silanes and resin cements.

Mechanical testing showed that by using a chloro-silane-based vapor-phase pretreatment, a silica-like surface layer was created on zirconia and increased the binding sites for the subsequent organo-silane primer for conventional dental adhesive applications. The approach has been a platform for other innovations that suggested new paths for a larger scope of dental materials.

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