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Inverse gas chromatography - A novel method for the examination of bond strength between tooth hard tissues and restorative materials

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Strong and durable connection between the remaining tooth hard tissues (dentin and enamel) and artificial materials applied to fill the cavity after caries removal is crucial to restore the teeth functions, e.g. biting or chewing. This bond strength is usually measured with the use of shear bond strength (SBS) tests that require a large number of healthy tooth hard tissues directly connected with the restorative material. The alternative proposed possibility consists of estimating the work of adhesion between dentin or enamel and restorative material with the use inverse gas chromatography (IGC). This method exploits the dependency between the values of surface energy of both connected materials and the strength of this connection. In this work the connection strength between bovine dentin and enamel and an exemplary restorative material was investigated by means of direct (SBS tests) and indirect (IGC) methods. For this purpose raw bovine tooth hard tissues were prepared according to the standard dental procedure with the use of commercial etch-and-rinse 3-component bonding system and characterized. After that procedure dentin and enamel samples, as well as restorative material samples were placed inside the chromatographic column and their surface energy values were measured. The same materials were also connected together and subsequently disconnected in SBS test giving the direct bond strength values. The obtained results show a clear dependency between the bond strength values measured by these two methods what show a great potential of inverse gas chromatography in bonding strength tests. IGC can also play a significant role in the designing of the dental materials and bonding system properties.

Biography

Zuzanna Okulus has completed her PhD in Chemistry from Poznan University of Technology (Poznan, Poland) in 2017. She is interested in materials science and engineering, especially for dental applications. Her research is focused on the preparation and characterization of new composite materials for potential dental applications. Her current research interests are tooth hard tissues characterization, inverse gas chromatography and spectroscopy, especially the application of these methods in the biomaterials research. She has published 10 papers in SCI journals concerning mainly the characteristics of experimental dental composites with calcium phosphates fillers, characterization of tooth hard tissues and application of Raman spectroscopy and inverse gas chromatography in dental materials research.

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