

Properties of Dental Materials Based on Monomer-Free ORMOCER®s

H. Wolter¹, W. STORCH¹, S. NIQUE¹, R. MALETZ², T. NEUMANN², and M. DANE BROCK², ¹Fraunhofer-Institut für Silicatforschung ISC, Würzburg, Germany, ²VOCO GmbH, Cuxhaven, Germany

Objectives: ORMOCER®-based dental filling materials are successfully applied in dentistry, due to the combination of organic and inorganic polymer structures and their derived properties (e. g., low shrinkage, high abrasion-resistance). The objective of this investigation was to provide novel ORMOCER® matrix materials without any monomers important for avoiding allergic reactions and a low viscosity for achieving high filler loads.

Methods: Novel methacrylate functionalized alkoxysilanes were developed and converted into inorganic polycondensates by formation of a $\equiv\text{Si-O-Si}\equiv$ structure. The polycondensates were isolated as liquid ORMOCER® resins (matrix materials). The viscosity was determined with a Bohlin Rheometer CVO10 and flexural strength, Youngs modulus and shrinkage of unfilled matrix materials were determined according to ISO 4049.

Results:

| | Matrix materials | |
|--------------------------|------------------|-------------|
| | I | II |
| Viscosity (25 °C) [Pa·s] | 3.6 – 5.5 | 18 – 24 |
| Flexural strength [MPa] | 64 (± 3) | 97 (± 8) |
| Youngs modulus [MPa] | 1222 (± 35) | 2149 (± 83) |
| Volume shrinkage [%] | 5.1 – 5.4 | 4.1 – 4.6 |

The isolated resins show low viscosities of ≈ 10 Pa·s, without incorporation of dentin bonding agent, a small amount of a dimethacrylate (≤ 1 mol %) was used for the reaction. According to the different structural units and functional moieties, the Youngs modulus can be adjusted with low shrinkage and promising values.

Was ist bei der Erstellung des Abstracts zu beachten:

| | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Titellänge: | Max. 10 Wörter |
| Autor: | Nennung jedes Autors inkl. Institution in der Reihenfolge Vorname (Anfangsbuchstabe) und Nachname |
| Abstract: | Max. 300 Wörter (ohne Titel & Autoren), max. 1 DIN A 4 Seite, Tabellen und Grafiken sind möglich. Sprache: Deutsch oder Englisch |
| Unterteilung in: | <ul style="list-style-type: none">- Ziel- Methode- Ergebniss- Schlußfolgerung |

Conclusion:

The achieved matrix materials without any conventional monomers are promising candidates for the realization of durable, aesthetic, and biocompatible dental composites by incorporation of functionalized hybrid fillers.