

Schwitalla AD; Spintig T; Kallage I; Müller WD, Flexural behavior of PEEK materials for dental application. Dental materials : official publication of the Academy of Dental Materials; VOL: 31 (11); p. 1377-84 /201511/

ABSTRACT: The high-performance thermoplastic polymer PEEK (poly-ether-ether-ketone) is used as alternative implant material to metals since 1998 in many medical fields due to its bone-like mechanical properties. These iso-elastic characteristics of PEEK lead to the assumption, that it could represent a viable alternative to conventional materials also in the field of dentistry. Therefore the mechanical properties of different PEEK-compounds should be evaluated via the three-point bending test.

METHODS: 150 specimens of 11 different PEEK-compounds were tested via a three-point bending test using a universal testing machine (Z010, Zwick GmbH & Co, Ulm, Germany) after dry storage on the one hand and after incubation at 37°C in Ringer solution (Fa. Braun Melsungen AG, Melsungen, Deutschland) for one day, 7 days, 28 days und 84 days on the other hand and the material parameters bending modulus and bending strength were evaluated.

RESULTS: The results regarding the bending moduli ranged from 2.73 ± 0.26 GPa for an unfilled brand to 47.27 ± 10.3 GPa for a carbon fiber reinforced PEEK with unidirectional continuous carbon fibers. Accordingly the bending strengths of these two material types ranged from 170.37 ± 19.31 MPa to 1009.63 ± 107.33 MPa.

CONCLUSIONS (SIGNIFICANCE): All tested specimens showed higher values than the prevailing minimum strength for plastic materials and their application in dentistry of 65 MPa (DIN EN ISO 10477). This underlines the applicability of PEEK in dentistry and points out the possibility to offer patients metal free restorations, especially in the presence of allergies and/or bruxism.

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