Fiber-Reinforced Composites for Dental Applications

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DOI: https://doi.org/10.1155/2018/4734986

Editorial

Special issue:

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Fiber-reinforced composites (FRCs) are composite materials with three different components: the matrix (continuous phase), the fibers (dispersed phase) and the zone in between (interphase). FRC materials present high stiffness and strength per weight when compared with other structural materials along with adequate toughness. FRCs have been used for numerous applications in various engineering and biomedical fields for a long time. The reinforcement of dental resins with either short or long fibers on the other hand, has been described in literature for more than 40 years [Vallittu and Lassila, 1992]. FRCs based on carbon, polyaramid, polyethylene, and glass have been largely studied and among all, glass fibers of various compositions are more commonly applied as restorative and prosthetic materials [Vallittu and Sevelius, 2000; Saker and Özcan 2015].

FRCs have been intensively investigated with a particular emphasis on mechanical properties such as fracture toughness, compressive strength, load-bearing capacity [Garoushi et al., 2011], flexural strength [Cacciafesta et al., 2007; Cacciafesta et al., 2008], fatigue resistance [Foek et al., 2013], fracture strength [Kumbuloglu et al., 2008] or on the effect of layer thickness [Bjelic-Donova et al., 2015], bacterial adhesion [Akalin-Evren et al., 2014], adhesion of fibers for various dental applications [Scribante et al., 2006; Bell et al., 2004; Sfondrini et al., 2011]. From clinical perspective, FRCs have been investigated for different clinical applications in prosthodontics, such as replacement of missing teeth by resin-bonded adhesive fixed dental prostheses of various kinds [Karaman et al., 2002; Kumbuloglu and Özcan, 2015], reinforcement elements of dentures or pontics [Garoushi et al., 2012] and direct construction of posts and cores [Zorba and Ozcan, 2007]. In other disciplines of dentistry, such as orthodontics FRCs have been suggested as active and passive orthodontic applications, (i.e. anchorage or en-masse movement units) and post-orthodontic tooth retention [Scribante et al., 2011; Sfondrini et al., 2014] and in periodontology for splinting mobile teeth in an attempt to prolong tooth extraction [Kumbuloglu et al., 2011].

With the introduction of new technologies, nanofillers, resin matrices, fibers, adhesion protocols, application techniques the design principles of FRC devices need further understanding which open new fields of research both preclinically and clinically [Sfondrini et al., 2014; Scribante et al., 2015]. On the basis of these considerations, BioMed Research International prepared the present Special Issue on “Fiber Reinforced Composites for Dental Applications” in an attempt to explore these new variables related to FRCs.

Guest Editors do hope that this Special Issue would be interesting for the readers of the journal and wish that the present work could help both clinicians and researchers to understand FRC applications and properties. Finally, Guest Editors would like to thank the Editorial Board of BioMed Research International for the invitation to prepare this Special Issue. A special thank is also addressed to Sam Rose for kind suggestions during call-for-papers and to Sara Ashraf for excellent assistance during manuscript management track.

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