

Selected research topics in Biomedical Engineering: Developments in Dental Research

Location: Kleiner Hörsaal, Universitäres Zentrum für Zahnmedizin Basel (UZB)

Date and time: Thursday, March 7, 2019, 12:00-13:30

Fiber-reinforced composites for dental applications

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Abstract. Development of dental and medical biomaterials has been limited to use only isotropic bulk materials until recently, when first clinically applicable fiber-reinforced composites (FRC) have become to the clinical use in late 1990s. Present applications of FRC can be found in all disciplines of clinical dentistry and in certain applications of bone reconstructive surgery. All of these applications are having fibers of glasses in the resin-based matrix of FRC. Orientation of fibers in the polymer matrix may vary from unidirectional to bidirectional weaves and random fiber oriented mats. On the other hands, fibers can also vary in terms of length. Continuous and discontinuous (short) fibers are both utilized in clinical dentistry nowadays. Applications of this kind are in fixed dental prostheses, periodontal splints, retainers and fillings. Other properties of FRC in relation to the direction of fibers, like optical properties and bonding properties are also having their implications in dentistry, like in root canal posts, where transmission of curing light is a desired property for polymerization of the individually formed fiber post and the luting cement. Successful use of FRC in clinical dentistry requires comprehensive understanding of the mechanism of action of components of FRCs and the loading conditions where the device will be used. Lecture will show clinical examples of the use of glass fibers in different restorative and prosthetic applications, and give an insight to bioactive surgical FRC implants.

Curriculum. Pekka Vallittu has earned his degrees in Dental Technology in 1988, Doctor of Dental Surgery and Doctor of Philosophy in 1994, received Adjunct Professorship in 1995 and specialized in prosthodontics and stomatognathic physiology (European Prosthodontic Association Recognized Prosthodontist) in 2000. Presently, he is a Full Professorship and Chair of Biomaterials Science in the Faculty of Medicine, University of Turku, Finland and works as Dean of the Institute of Dentistry at the University of Turku and as the Director of Turku Clinical Biomaterials Centre (<http://www.biomaterials.utu.fi>). He holds Honorary Professorship at the University of Hong Kong, Pokfulam and Visiting Professorship at the King Saud University in Riyadh, Saudi Arabia. His predominating research activity on fiber-reinforced composites started from his hobby of model aircrafts and has lasted over 30 years since early 1980's. The first clinical applications of fiber-reinforced composites were found in clinical dentistry and thereafter in combination with bioactive component in bone surgical applications as non-metallic bioactive implants. Pekka Vallittu has over 520 ISI Web of Science Index original publications and over 160 internationally granted patents. He has been awarded e.g. by the Distinguished Scientist Award in Prosthodontics and Implant Research by the International Association of Dental Research (IADR), the Acta Odontologica Scandinavica Big Prize and the Bensow-Äyräpää Prize.