



Use of Fibers in Denture Base Acrylic and Composite Some Research Paper Summaries

Dyer, S., Lassila, L., Jokinen, M., Vallittu, P. "Effect of cross-sectional design on the modulus of elasticity and toughness of fiber-reinforced composite materials." The Journal of Prosthetic Dentistry. 2005, 94:219-26

The present study suggests that the manner in which the fiber reinforcement is arranged cross-sectionally in a fiber-reinforced composite prosthesis will determine the modulus of elasticity and toughness, ranging from no increase in mechanical properties to a 200% to 300 % increase for elastic modulus or 70-fold increase for toughness. Specific areas of prostheses, such as fixed partial denture connectors and the palatal areas of dentures, may be custom designed to yield enhanced properties of elastic modulus and toughness, making the prostheses more resistant to failure.

John, J., Gangadhar, A., Shah, I. "Flexural strength of heat-polymerized polymethyl methacrylate denture resin reinforced with glass, aramid, or nylon fibers." The Journal of Prosthetic Dentistry. 2001,86:424-7.

This in vitro study demonstrated a significant improvement in the flexural strength of conventional acrylic resin when it was reinforced with glass or aramid fibers.

Karacaer, O., Tezvergil, L., Vallittu, P. " The effect of length and concentration of glass fibers on the mechanical properties of an injection and a compression molded denture base polymer." Journal of Prosthetic Dentistry. 2003 Oct;90(4);385-93

The transverse strength, elastic modulus and impact strength of injection-molded denture base polymer increased significantly with the use of chopped E-glass fibers. In the compression molded groups fiber concentration affected modulus of elasticity and impact strength significantly.

Karacaer, O., Dogan, OM., Tincer, T., Dogan, A. " Reinforcement of maxillary dentures with silana-treated ultra high modulus polyethylene fibers." Journal of Oral Science. 2001 Jun;43(2):103-7

...complete upper dentures were made for patients having a history of mid-line fracture....and reinforced with ultra-high modulus polyethylene fiber in woven form. At end of 18 months, all of the dentures were well accepted and did not show any signs of fracture.

Kim, SH., Watts, DC. "The effect of reinforcement with woven E-glass fibers on the impact strength of complete dentures fabricated with high-impact acrylic resin. " Journal of Prosthetic Dentistry. 2004 Mar;91(3);274-80

The impact strengths of maxillary complete dentures fabricated with high-impact acrylic resin (Lucitone 199) increased by a factor greater than 2 when reinforced with woven E-glass fiber.

Narva, K., Lassila, L., Vallittu, P. "Flexural fatigue of denture base polymer with fiber-reinforced composite reinforcement." Applied Science and Manufacturing. 2005;36(9);1275-1281

Flexural fatigue of denture base polymer with various fiber reinforcements was investigated. The PMMA-preimpregnated glass-fiber reinforcements resulted in a higher number of loading cycles than polyethylene fiber ribbon.

Narva, K., Lassila, L., Vallittu, P. "Fatigue Resistance and stiffness of glass fiber-reinforced urethane dimethacrylate composite." Journal of Prosthetic Dentistry. 2004 Feb;91(2);158-163

The aim of this study was to investigate the fatigue resistance and stiffness of E-glass fiber-reinforced composite. The results suggest that the fatigue resistance of the fiber-reinforced material examined was increased....

Tsue, F., Takahashi, Y., Shimizu, H. "Reinforcing effect of glass-fiber-reinforced composite at the proportional limit of denture base resin." Acta Odontologica. 2007;65(3) 141-48

Objective: To evaluate the reinforcing effect of fiber-reinforced composite (FRC) on flexural strengths at the proportional limit (FS-PL) of a denture base resin. Conclusion: The unidirectional glass-fiber-reinforced composite had a reinforcing effect on the flexural strength at the proportional limit of the denture base resin.

Uzun, G., Hersek, N., Tincer, T. "Effect of five woven fiber reinforcements on the impact and transverse strength of a denture base resin." Journal of Prosthetic Dentistry. 1999;81(5);616-20

This study measured the effect of 5 fiber strengtheners on the fracture resistance of denture base acrylic. The impact strength of denture base acrylic resins was increased with fibers in woven form.

Uzun, G., Keyf, F., "The Effect of fiber reinforcement type and water storage on strength properties of a provisional fixed partial denture resin." Journal of Applied Biomaterials. 2003 Apr; 17(4):277-86

The addition of fiber reinforcement enhanced the physical properties (the transverse strength, the maximal deflection, the modulus of elasticity) of the processed material over that seen with no addition of fiber.

Vojdani, M., Khaledi, A. "Transverse strength of reinforced denture bases resin with metal wire and E-glass fibers." Journal of Dentistry, Tehran University of Medical Sciences. 2006;3(4);167-172

The transverse strength of heat-polymerized denture base resin was enhanced considerably by using metal wire and glass fibers reinforcements. However, the addition of unidirectional glass fibers was significantly more effective method to improve flexural strength of denture base acrylic resin.

Other Research Papers Related to the Use of Fiber Reinforcements

Araujo, P.H.H., Sayer, C.; Poco, J., Giudici, R. "Techniques for reducing residual monomer content in polymers: a review." Article from: Polymer Engineering and Science. July 1, 2002.

Chen, H., Lai Y., Chou I., Hu C., Lee S. "Shear bond strength of provisional restoration materials repaired with light-cured resins." Operative Dentistry. 2008, Sep-Oct; 33(5):508-15.

Dall'Oca, S., Papacchini, F., Goracci, C., Cury, A.,; Suh, B., Tay, F. Polimeni, A., Ferrari, M. "Effect of oxygen inhibition on composite repair strength over time." Journal of biomedical materials research. Part B, Applied Biomaterials 2007,81(2):493-8.

- Dyer, S., Lippo V. J., Lassila, V. J., Jokinen, M., Vallittu, P. Effect of cross-sectional design on the modulus of elasticity and toughness of fiber-reinforced composite materials. *Journal of Prosthetic Dentistry*. 2005, 94: 219-26.
- El-Askary, F., Fawzy, A., Elmohsen, H. "Tensile Bond Strength of Immediately Repaired Anterior Microfine Hybrid Restorative Composite Using Nontrimmed Hourglass Specimens." *Journal of Adhesive Dentistry*. 2009, 11(1): 41-47.
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- Negrutiu, M., Sinescu, C., Goguta, L., Topala, F., Romînu, M., Podoleanu, A. "Different Types of Fiber Reinforced All Dentures Bases Evaluated by En-Face Optical Coherence Tomography and Numerical Simulation." *World Academy of Science, Engineering and Technology*. 2009, 53:1236-1241.
- Shawkat, E, Shortall, A., Addison, O., Palin, W. Oxygen inhibition and incremental layer bond strengths of resin composites. *Dental Materials*. 2009, 25(11):1338-1346.
- Suh, B., Tay, F.R., Pashley, D.H., Ferrari, M., Goracci, C., and Yiu, C. "Incompatibility Profiles of All-in-one Adhesives. II. Contribution of Oxygen Inhibition." *The HKU Scholars Hub. The University of Hong Kong*. 2004. Sourced from: <http://hub.hku.hk/handle/10722/53904>
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