♦P7

Calcium Phosphate Cement Reinforced with Chopped High Performance Polyethylene Fiber.

S. Hirayama[1]*, T. Ikemi[1], Y. Tsujimoto[1], M. Yamazaki[1], L.C. Chow[2], S. Takagi[2], J. M. Antonucci[3].

[1]Nihon University, Chiba, Japan, [2]American Dental Association Health Foundation, Paffenburger Research Center,

[3]National Institute of Standards and Technology, Gaithersburg, MD, U.S.A.

A self-setting calcium phosphate cement (CPC), consisting of tetracalcium phosphate (TTCP) and dicalcium phosphate anhydrous (DCPA), reacts with water and hardens fast (30 min) to form hydroxyapatite (HA) under physiological conditions as the final product. Although this CPC is finding increasing use as a biomaterial, it is presently limited to low stress bearing applications because of its relatively low strength and highly brittle nature. Recently the mechanical properties of CPC reinforced with chopped carbon fiber have been reported. **Objective:** To evaluate the effect of adding chopped high performance polyethylene fibers (PEF) to CPC on the physical and mechanical properties of this cement. **Materials and Methods:** CPC mixed with distilled water containing (0, 1.0, and 2.0) wt % dispersed PEF (length 5～10 mm, diameter 35μm). Hardening times at 37℃ were assessed with a Gilmore needle method and the extent of HA conversion by X-ray diffraction (XRD). Mechanical strength was assessed by Diametral tensile strength (DTS), flexural testing (FS) and toughness of specimens hardened after 24 h at 37℃, 100 % relative humidity. Scanning electron microscopy (SEM) was used to analyze fracture behavior. **Results:** PEF reinforced CPC had similar handling characteristics, hardening times ($\approx$ 30 min), and HA conversion (XRD) as the control CPC. However, significant differences in strength and toughness ($p < 0.05$) were noted for PEF-CPC vs CPC. Flexural strength (mean$\pm$s.d., $n = 5$) values were (21.2 ± 5.5) MPa and (16.4 ± 1.9) MPa, for 1.0 wt % PEF-CPC and CPC, respectively. Unlike the fractured control specimens, the PEF-CPC specimens did not fail catastrophically but exhibited fragment cohesion in spite of multi cracking. SEM indicated that crack propagation was arrested by fiber bridging and resistance to fiber pull out. **Significance:** Incorporation of 1.0 wt% of PEF fibers into the brittle CPC matrix provides a means to enhance both the strength and toughness of this important biomaterial.

♦P8

The Study of Calcium Hydroxide Points.

T. Yanagidani, R. Terata, K. Nakasima, K. Sekine, M. Kubota.

Department of Operative Dentistry and Endodontics, School of Dentistry, Iwate Medical University, Morioka, Japan

The purpose of this study was to evaluate the shape, the composition of Calcium Hydroxide Points (CH Point) and to determine the pH level in water. The shape of CH Point was measured by using a profile projector. The composition of the CH Point was analyzed by the X-ray diffraction and the EPMA. #60 CH Point was stored in 10ml of demineralized water that was replaced every day or not replaced for 7 days period. The pH levels of the water were measured by using an ion electrode with an ion meter every day.

The shape of CH Point met the ISO standard No.6877-4.4. The CH Point contained calcium hydroxide. The pH levels of the water stored CH Point rapidly increased above 10 in both water replaced group and non-replaced group. The pH levels kept up 7 days in non-replaced water group, but pH levels decreased in water replaced group