IN VITRO EVALUATION OF SELECTED PROPERTIES OF NEW FLOW-TYPE DENTAL COMPOSITE

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Introduction

Dental composites used as restorations are required to have long-term durability in the oral cavity. In some cases the interaction of these materials with oral fluids may involve dissolution or degradation of materials while in others the interaction may cause an uptake of fluids into the structure of the material which may affect the mechanical properties of the materials [1-3]. The formation of deposits on the dental restorations was not quite well recognized yet.
In this study, the properties of new experimental flow-type dental composite and its behavior in artificial and natural saliva environment in comparison to commercial materials was investigated.

Materials and Methods

Materials used in this study were:

- experimental composite (36% wt. of resins (Bis-GMA, EBADMA); and 64% wt. of fillers (Ba-Al-Si glass and nanosilica), marked as "*Exp*".
- Flow Art (Arkona) (38% wt. of Bis-GMA, UDMA, TEGDMA i Bis-EMA) and 62% wt. of fillers: Ba-Al-Si glass and nanosilica), marked as "*FA"*,
- Charisma Opal Flow (Heraeus) (UDMA and EBADMA resins and 65% wt. of fillers: Ba-Al-F silicate glass, YbF_3 and SiO_2), marked as "*Ch*".

All materials had shade of A1.
Specimens for testing were made according to ISO 4049 as bars of dimensions 2x2x25 mm. Materials were cured using halogen lamp (Cromalux 75, Mega-Physik) via Mylar strips. Microhardness measurements (Vickers) were taken on cured surface using tester FM-800 (Future-Tech Corp.) with the load of 0.49N. Flexural test was made using Zwick Z2.5 universal testing machine, conditions of the test were according to ISO 4049.
After curing all specimens were placed in distilled water in the incubator (37^{o}) for 24 hours. Next they underwent reference mechanical tests. The rest of the specimens were placed in eppendorf tubes (2 cm^3) filled with natural saliva (marked "*n"*) (collected by a volunteer) and artificial saliva (marked "*a"*) (ISO 10271). Next tests were made after 28 days of incubation (and also 7 days in the case of microHV). Results were statistically analyzed using Statistica software (StatSoft Inc.).
Surface of the specimens was also tested by FTIR (Hyperion 3000 with Vertex 70, Bruker) for formation of deposits.

Results and Discussion

In the case of strength (FIG. 1), no statistically significant differences for *Ch* and *FA* materials were observed. For *Exp* material, the statistically significant diminishing in strength was observed in both media; however, it still exceeds required value described in ISO 4049. Due to the relatively short period of incubation, Authors did not notice significant changes in flexural strength. These tests are continued at present.

Microhardness (FIG. 2) showed a significant initial increase in each case due to a dark phase polymerization [5]. In the long term of incubation, the microhardness significantly diminished due to hydrolytic degradation of resin matrix [2].

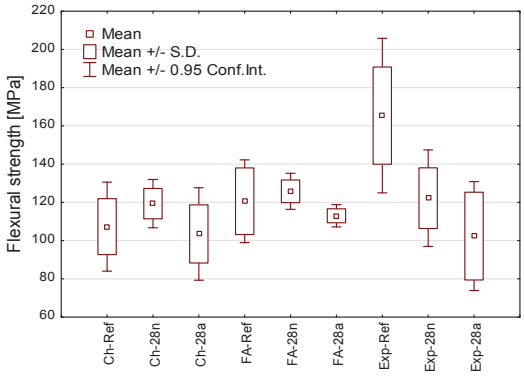

FIG. 1. Flexural strength of tested materials.

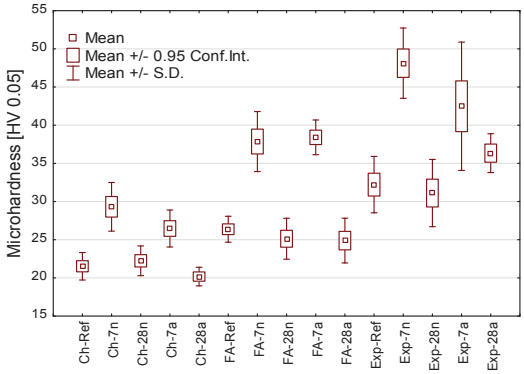

FIG. 2. Microhardness of tested materials.

FTIR analysis (FIG. 3) showed the formation of carbonated calcium phosphates deposit only in the case of artificial saliva environment. Natural saliva, probably due to inter-individual variability of composition, pH and also the presence of enzymes (affecting pH), did not produced any significant deposit.

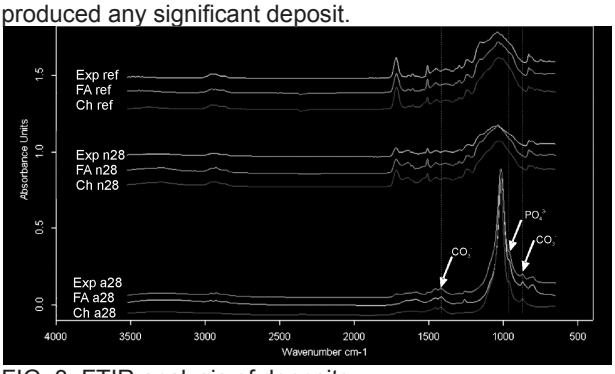

FIG. 3. FTIR analysis of deposits.

Conclusions

Experimental material showed a slight diminishing in strength due to lower resistance for hydrolytic degradation. Microhardness of *Exp* material was similar to *FA* and higher than *Ch* materials. Natural saliva did not cause formation of any deposits during the test.

Acknowledgments

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