Type of presentation: Poster

ID-13-P-2493 Determination of AFM surface roughness parameters and topography of contemporary dental nanocomposites after artificial saliva storage

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Smooth surface of a dental restoration is necessary to obtain clinical durability and aesthetic appearance, as well as to prevent discolorations and dental biofilm retention [1]. Therefore, surface of the restoration has to be stable in the oral environment where it is constantly exposed to saliva humidity. Natural saliva is an aqueous hypotonic solution of water, containing inorganic ions, organic constituents and proteins [2]. There are many artificial saliva products, which can serve as a replacement for natural saliva in experiments that simulate oral environment conditions in vitro. The aim of this study was to determine the effect of artificial saliva storage on AFM roughness parameters and topography of dental composites.
Four representative dental resin-based composites were tested in the study: nanofilled and nanohybrid (Filtek Ultimate Body, and Filtek Z550, 3M ESPE), microfilled (Gradia Direct, GC) and microhybrid composite (Filtek Z250, 3M ESPE). Each polymerized specimen was polished according to dental polishing protocol (Shofu). Topography and roughness of each specimen was examined by AFM before and after artificial saliva storage (aqueous solution of Sinclair saliva supporting tablets, in dark containers, at 37 ºC in a water bath, for three weeks).
The AFM images of both testing groups show surfaces with furrowed topography, created by the abrasive wear mechanism of the conducted polishing method. However, the artificial saliva storage did not qualitatively change the topography of the tested materials (Fig. 1). Calculated AFM average roughness parameter (Ra) showed a reduction of roughness after storage in saliva for both nanofilled and nanohybrid composites, as well as for microfilled composite (Fig. 2). Only the microhybrid material showed different results with increased roughness values after the storage. AFM peak-to-valley distance roughness (Rp-v) also decreased for nanohybrid and microfilled material after the medium; for nanofilled the influence of storage solution did not show a significant difference; and again only the microhybrid material had higher roughness values after the saliva storage (Fig. 3). The artificial saliva has not negatively affected surface topography of the tested nanocomposite materials. However, inorganic filler particles can be removed or leached by the artificial saliva medium, leading to positive or negative changes in roughness values, depending on the size of filler particles.

1. Antonson SA et al. Comparison of different finishing/polishing systems on surface roughness and gloss of resin composites. J Dent 2011; 39s:e9-e17.
2. Gibson J et al. Natural and synthetic saliva. Biotechnol Genet Eng Rev 1994;12:39-61.

Acknowledgement: Supported by Project TR 035020 and Project III-45006 of the Ministry of Education, Republic of Serbia; and 3M (East) AG company and Mikodental – Shofu, Japan for Serbia.

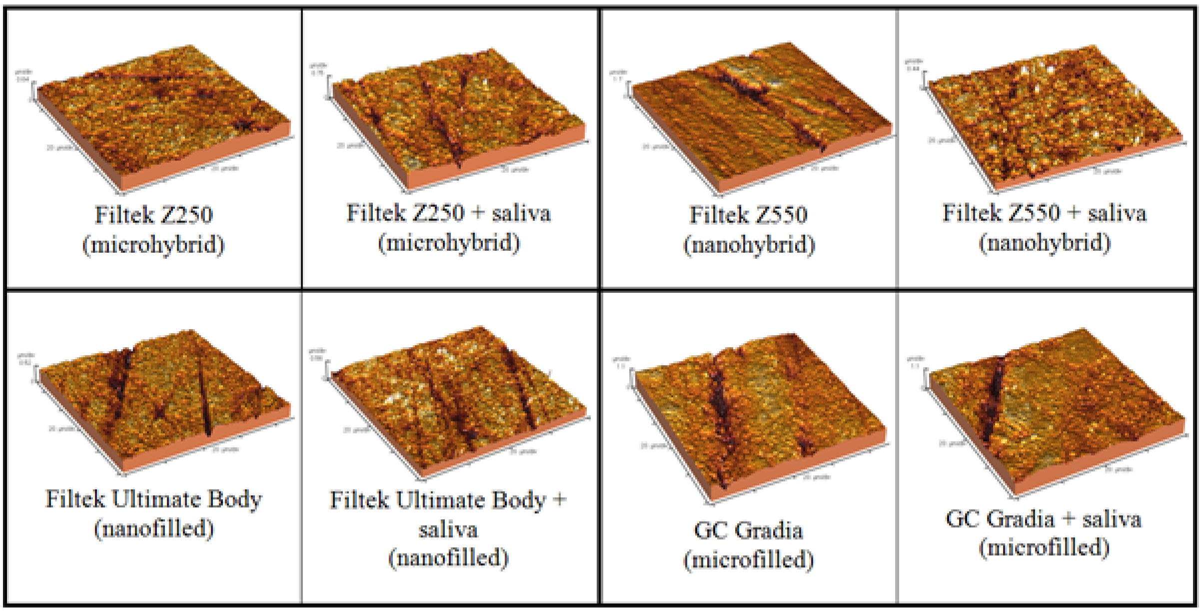

Fig. 1: AFM images of surface topography of the tested materials

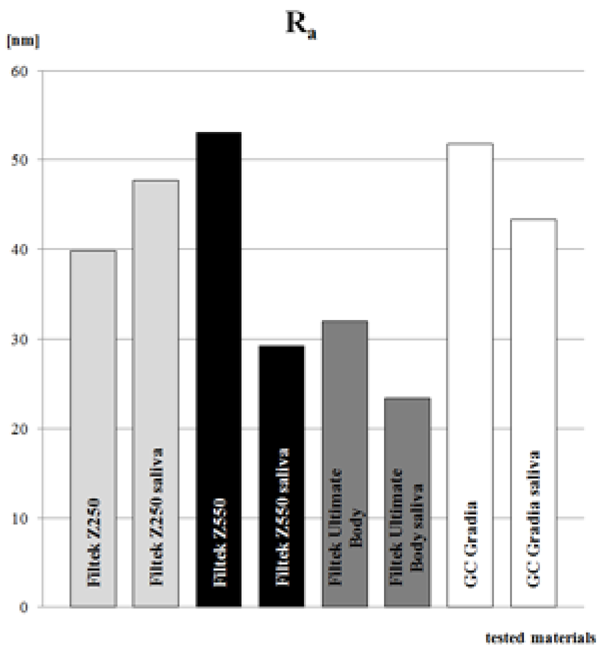

Fig. 2: Comparison of AFM average roughness values (Ra) among the tested materials

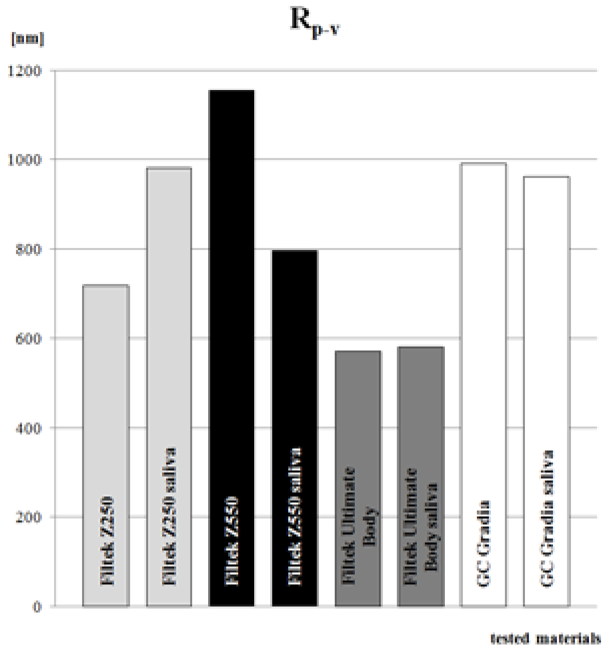

Fig. 3: Comparison of AFM peak-to-valley roughness values (Rp-v) among the tested materials