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Comparative Analysis of Artificial Agings on Different Denture Base Materials

L. Kurzendorfer¹, S. Tamjdtash², N. Kommerein², S. Hahnel¹, M. Rosentritt¹

¹University Hospital Regensburg, Regensburg, Germany, ²Hannover Medical School, Hannover, Germany

Objectives Objectives: Aim of this study was to compare effects of artificially aging on the roughness and surface free energy of two different denture base materials.

Methods Methods: Polymethylmethacrylate (PMMA) and polyetheretherketone (PEEK) specimens were aged with two surface treatments (A=grit of 1200; B=grit of 4000; wet; n=10 per material, surface treatment and aging). Artificial aging was performed by thermocycling (TC, 5°C and 55°C, 2x5000 cycles), storage in hydrochloric acid (HA, 7d, pH: approximately 1.52, 37°C) and storage in 1% sodium hypochlorite (SH, 2.5d, 37°C). Contact profilometry (CP; Perthometer S6P, Perthen Mahr, G) was used to measure line roughness R_a and R_z . Surface free energy (SFE) was determined using the sessile drop method (drop volume=2 μ L; millipore water and diiodomethane; DSA25, Krüss, G). Materials without aging were used as reference. Statistics: Shapiro-Wilk, Kruskal-Wallis test ($\alpha=0.05$).

Results Results: R_a , R_z and SFE of both materials were significantly ($p\leq 0,001$) influenced by aging (TC, HA, SH). Significant ($p\leq 0.049$) differences were found between R_a , R_z and SFE. Aging influenced the material properties, particularly surface treatment B and SFE of both materials. Despite uniform surface treatments, R_z exhibited variations in roughness after artificial aging, especially with surface treatment B.

Conclusions Conclusions: The aging processes were influenced by different surface treatments, B showing the greatest variations. The parameters were most influenced by SH. The two aged materials showed minor differences to each other. However, for dentures it is recommended to minimize exposure to aging influences and to polish their surface to prevent long-term changes.