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Enhancing Pmma Properties: Nano Graphene, Boron Nitride Impact in Vitro

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Objectives The aim of the study was to characterize the efficacy of loading nanographene oxide (nGO) and boron nitride (BN) alone and in combination on the physical, chemical, and mechanical properties of PMMA. The objectives were to fabricate the neat and modified specimens. Then characterize them with spectroscopy and microhardness and contact angle analysis.
Methods Four different groups were prepared, including the control group (G1).2.5 wt% nGO was added to the liquid component (G2) , 1 wt% boron nitride was added to the powder component (G3) and 2.5 wt % nGO with 1 wt % BN combined (G4.) The resulting nanocomposite were characterized using microhardness and compressive strength analysis, contact angle analysis and degree of conversion was calculated using Fourier Transform Infrared spectroscopy. Statistical significance was done using Kruskal-Wallis test for the microhardness, and a one-way ANOVA was conducted for the degree of conversion and contact angle measurements.
Results The addition of nGO (184 ± 16) (p >0.001) significantly increased the microhardness compared to the unmodified PMMA (156 ± 15.3) . Results from the contact angle analysis revealed that the incorporation of GO (84.09° ± 1.49) and BN alone increased the contact angle. However, the addition of both nanofillers enhanced the hydrophilicity (61.4° ± 2.36). The nanofillers added decreased the degree of conversion.
Conclusions This study explored the potential of using nGO and BN alone and in combination with PMMA in low concentrations. The addition of both nanofillers have had some effect on the physcial, chemical and mechanical properties. Higher hardness was observed when using nGO and hydrophilicity was also increase with addition of both nanoparticles. This suggests that usefullness of nGO and BN alone and in combinaiton could serve as a promising dental biomaterials for dentures and other dental removeable prosthesis.