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Original Articles

Structure, Composition, and Mechanical Properties of Australian Orthodontic Wires

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Abstract

Objective: To investigate the surface morphology, structure, elemental composition, and key mechanical properties of various sizes and tempers of Australian wires.

Materials and Methods: Three types of Australian wire were used: 0.016" regular, 0.018" regular+, and 0.018" special+ (A.J. Wilcock, Whittlesea, Victoria, Australia). Each type of wire was subjected to scanning electron microscopy (SEM) analysis, x-ray energy dispersive spectroscopy (EDS) investigation, Vickers hardness testing, and tensile testing. The modulus of elasticity and ultimate tensile strength were determined. Hardness, modulus, and strength data were analyzed with one-way analysis of variance (ANOVA) and Tukey testing at the .05 level of significance.

Results: All three types of Australian wire were found to possess considerably rough surfaces with striations, irregularities, and excessive porosity. All three wire types had high levels of carbon and a similar hardness, which ranged within 600 VHN (Vickers hardness number), and a similar modulus of elasticity (173 to 177 GPa). The 0.018" special+ had a significantly lower tensile strength (1632 MPa) than the 0.016" regular and the 0.018" regular+ wire (2100 MPa).

Conclusions: Australian wires did not show variation implied by the size or temper of the wires.

Keywords: [Australian wire](#), [Stainless steel](#), [SEM](#), [EDS](#), [Hardness](#), [Modulus of elasticity](#)

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