A Study of the Mechanical Properties of Thermally Treated Recycled Glass Media Used in Vibratory Mass Finishing

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This paper reports on the outcomes of a study concerned with the mechanical properties of a new abrasive tool manufactured wholly from thermally treated recycled glass. These properties will aid in understanding the behaviour and performance of the treated glass. Mechanical properties were investigated using the most current and advanced nano-indentation methods. A computer controlled Nano Indentation hardness test (NHT) machine was used to obtain values of hardness and elastic modulus. The nano-indentation process was equipped as a FEM parametric model. The model was then processed by purposely developed numerical objective optimization algorithms in order to determine comprehensive material properties. The aim was to establish the optimal solution with reference to mean square root optimization criterion. The results show large elastic recovery upon unloading similar to a pure silica reference material and a surface roughness unique to this material which is entirely crystalline. The indentation mapping shows significant effect of heat treatment cycles on mechanical properties of recycled glass media.

Keywords: nano-indentation, Finite Element Modelling, Materials properties, Glass, vibratory mass finishing.

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