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Ecotoxicological Analysis of Glasses Obtained From Fly Ashes

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In this work a mixture design analysis was used to study the effect of coal ashes and galvanic, feldspar and fluorite residues in glassmaking. Five formulations with four factors at two levels were designed. The residues were dried, sieved, mixture according the design and melted at 1,450°C during 2h for stabilization using 10%wt of CaCO₃ (fluxing agent). The melts were cast in a water refrigerated mold and annealed (600°C) and the glasses were analyzed regarding their transition temperatures (T_g and T_m) by differential thermal analysis (DTA, air, 20°C/min) and biological effects by ecotoxicological tests (EN40). The results were analyzed by analysis of variance and plotted in response surfaces graphs in order to determine the individual influence of each residue in the studied properties. As a result, the melting temperature is strongly dependent on silica content of each glass, and the fluorite residue, being composed mainly by silica, strongly affects T_m. The ecotoxicological analysis shows the main influence of the galvanic residue due to the high iron and zinc content of this waste.

Keywords: fly ashes; residues; vitrification; mixture design; ecotoxicological effect.