# Development and evaluation of low glass transition temperature glasses for immobilization of heavy metals

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## ABSTRACT:

This study deals with the preparation and the investigation of new glasses designed for the immobilization of heavy metals entrapped in aluminosilicate minerals (perlite and bentonite). The aluminosilicate minerals were used to adsorb heavy metal ions (copper and lead). Then they were glassified by incorporation within a borate glass. Finally, the properties and the ability of the final glasses to retain heavy metals in their structure were evaluated.

The structural study of the glassified samples and the precursor glasses was accomplished by the use of infrared spectroscopy and Raman spectroscopy. The properties of the glassified samples and the precursor glasses that were investigated in this work include density, molecular volume, glass transition temperature, thermal expansion coefficient, chemical durability, and leachability of heavy metals from the glassified samples. These properties were then related with the structure of the resulted glasses.

The results yielded from this work were quite encouraging. Particularly, glassification of aluminosilicate minerals bearing heavy metals was achieved by incorporation within a diborate glass. The amount of aluminosilicate minerals added in the reagents batch was up to 60 %w/w whereas the melting temperature did not exceed 1000ºC. The glassified samples that embodied 60%w/w aluminosilicate minerals exhibited an excellent chemical durability whereas they displayed a high ability to retain heavy metals in their structure. In especial, their heavy metal retaining ability was 200 times greater than that of the precursor diborate glass. These results

are directly associated with the structure of the glassified samples, especially with the formation of Si-O-Si bridges, as it was demonstrated by the structural analysis.