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Lonar Impact Glass Applied as a Standard for Long-Term Performance Assessment of Na-Ba *Borosilicate Glass Forms* in Geological Environment

Amit Kumar[1,2], J. P. Shrivastava[1] and Sattam Chakraborty[1]
[1]University of Delhi, India
[2]Banaras Hindu University, India

For long-term disposal, high-level nuclear waste is usually immobilized into synthetic Na - Ba borosilicate glass types, however, their performance in the geological repository is uncertain and require calibration against naturally occurring low silica impact basaltic glass (analogue) as a reference standard. For this purpose, comparative experimental and natural alteration studies were performed on synthetic Na - Ba borosilicate and impact basaltic glass. Degree of alteration and formation of altered products when studied with respect to time under similar experimental conditions (100 oC and 250 psi) revealed three fold rapid alteration in case of Na - Ba borosilicate glass types as compared to impact glass. Owing to fast dissolution of Na - Ba borosilicate glass, high amount of Al, Ca, K, Mg, Na and Si ions released into solutions with the formation of secondary silicates as residue. Mineralogy of the neo-formed minerals when compared to naturally derived secondary silicates from impact glass in three geological time windows assessed by 14C AMS method revealed that naturally altered impact basaltic glass show paragenetic order of saponite > calcite > montmorillonite > montmorillonite/chlorite mixed layer > siderite> chabazite > aragonite > analcime. Almost similar mineralogical assemblages were recorded when impact basaltic glass treated under hydrothermal-like conditions. Moreover, saponite formed as a chief post Na - Ba borosilicate alteration product. Thus, Na - Ba borosilicate structure is vulnerable for alteration as compared to the impact basaltic glass. Consequently, later seems to be more reliable as standard for calibration of nuclear wastes.

Keywords: Lonar Impact basaltic glass, Na-Ba borosilicate glass, Alteration, Secondary Silicates, Mineral Paragenesis