

City Tech's. ESP Research Abstract.

(1) Project Title : Latest NASA, Boeing and defense activities. For the use of Geopolymers for space construction.

(2) Student's First and Last names : Terrance Bisnauth.

Saim Wasim.

Julio Martinez.

(3) Faculty mentor first and last name : Professor Akm S Rahman.

(4) Abstract.

Geopolymers or the term geopolymer was developed by Davidovits in 1978 to represent a broad range of material that is characterized by chains or networks of inorganic molecules. That are inorganic cementitious binders produced by polymeric reaction between an aluminosilica rich material and an alkali metal hydroxide/silicate liquid, to form a binding gel, which can be utilized to bond fine and course aggregate to produce concrete. So the purpose of this research is to develop lunar regolith based geopolymer concrete and perform differential shielding studies on various geopolymer formulations to determine if sufficient protection from radiation in space environments can be achieved or satisfied. Because earth-based applications have utilized commonly available materials such as metakaolin, fly ash or even rice husk researchers have reproduced lunar regolith to manufacture geopolymer concrete specimen or lunamer by activating the regolith with alkali liquid.

So since geopolymers are highly conductive it has being enhanced further for the use in electromagnetic (EMI) shielding likewise electrostatic discharge (ESD) application. This was achieved by adding carbon fibres or carbon black, that is a conductive filler material. And the results of this process indicated that conductive geopolymer matrices are very effective in blocking, electromagnetic waves of frequencies, that is greater than one (1) GHz. Similarly, for us to understand the usage of geopolymer in space construction we need to characterize and organize, the radiation shielding effectiveness of lunar concrete and geopolymer. This would be achieved by using a variety of locally available radiation sources. By constructing geopolymer and lunamer concrete matrices and their ability to shield radiation will be evaluated.

The matrices will be prepared by combining fly ash, as the pre-cursor, barite (BaSO_4) and hematite (Fe_2O_3) as the aggregate and metallic chips, which represents the in earth-based construction practices. In addition to this, Boeing, NASA and defense activities would benefit directly from geopolymers from their funded missions to space by providing radiation shielding that could be used for projecting long-term space-based missions. Because cosmic radiation is the critical obstacle that prevents extended human space exploration. So an innovative solution to this adventure to space is to take advantage of the native shielding properties of the planetary material itself and utilize or create subsurface structures with it.

