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Preparation of Lunar Regolith Based Geopolymer Cement Under Heat and Vacuum

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Abstract

Ever since the beginning of the space program, lunar habitation has always been on peoples' minds. Prior researchers have explored habitat building materials—some based on earth-based construction materials, some based on *in-situ* lunar resources. Geopolymer cement is a cementitious binder made of aluminosilicate materials such as lunar regolith. A cementitious binder made of lunar regolith as the main geopolymer precursor, instead of as an added aggregate, is a solution that has not been deeply explored in prior works. This research explores the curing process of lunar regolith based geopolymer cement in an environment that loosely approximates the lunar environment, using the lunar average daytime temperature and a vacuum. The results did not show much promise for the samples cured under both heat and vacuum as the longest-cured data point did not meet compressive strength standards, but another pathway to lunar habitation may be found in a separate set of samples that cured under heat and ambient atmospheric pressure.

Keywords: Lunar regolith, lunar construction, geopolymer, lunar habitation

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