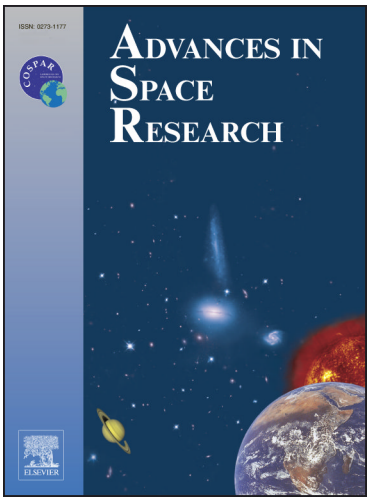

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PII: S0273-1177(17)30495-7
DOI: http://dx.doi.org/10.1016/j.asr.2017.07.001
Reference: JASR 13311

To appear in: *Advances in Space Research*

Received Date: 4 April 2017
Revised Date: 30 June 2017
Accepted Date: 2 July 2017

Please cite this article as: Chow, B.J., Chen, T., Zhong, Y., Wang, M., Qiao, Y., Compaction of Montmorillonite in Ultra-Dry State, *Advances in Space Research* (2017), doi: http://dx.doi.org/10.1016/j.asr.2017.07.001

Compaction of Montmorillonite in Ultra-Dry State

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Abstract

The current study discovers that uniaxial compression under ambient condition can directly cause strong bonding in ultra-dry montmorillonite, which is attributed to the secondary molecular interaction other than hydrogen bonding. The strength of so-processed material is sensitive to the lateral confinement condition of loading. Similar compaction pressure produces equally strong solids between quasi-static and impact loading modes. Gas permeability of the compacted solids is comparable to that of dense rocks. These findings shed light on the study of Martian regolith and in-situ resource utilization.

Keywords: Montmorillonite; compaction; Martian regolith; in-situ recource utilization

1. Introduction

Montmorillonite is one of the oldest engineering materials known to humankind. It consists of stacked silica-alumina lamellae (Odom, 1984). Isomorphous substitution imparts