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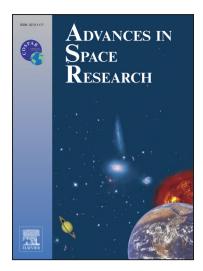
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ACCEPTED MANUSCRIPT

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

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