

Commercial Lunar ISRU for the Space Launch Industry: Cruder is Better

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Abstract

Lunar ISRU scenarios typically focus on making relatively high-added-value products (such as solar PVs) for off-Earth use only. Discussion of space mining in general focuses on high-value trace substances (e.g. platinum group metals) as exports to Earth, and hydroxyls and other volatiles for use only in space. This paper considers two potential bulk commodities with high availability on the lunar surface: space-weathered basalt fines and the oxygen in metal oxides. Basalt fiber can be produced by a simple process, and is strong enough that a tapered rotating sling could propel payloads at lunar escape velocity. Basalt aerobrakes could be flung to LEO depots to aid in aerocapture, reentry, and thermal protection of upper stages. Lunar oxygen (O₂ being most of the mass of most liquid-fueled rockets) could aid in powered descent. In short, abundant substances on the Moon could make cost-saving exports possible sooner than later, for the satellite launch industry.

