

THE EFFECT OF PEROXIDATION ON THE RATE AND EXTENT OF REDUCTION OF ILMENITE; R.A. Briggs, A. Sacco, Jr., Dept of Chemical Engineering, Worcester Polytechnic Institute, Worcester MA 01609

It is generally assumed that oxygen will be the first product produced economically from extraterrestrial materials [1]. By supplying oxygen requirements to LEO, lunar facilities can achieve an economic payback from its activities. Ilmenite (FeTiO_3) in particular has been identified as a potential source of oxygen in the lunar soil [2]. However an effective process to reduce ilmenite has not been developed. To enhance the rate and extent of reduction, a preoxidation step is being tried. Carbon dioxide, water, and oxygen are being investigated as oxidants. Preliminary experiments are being carried out in a 3/8 in. quartz tube reactor. Weight gain curves as well as weight loss curves have been generated. These results suggest that complete reduction of ilmenite to Fe and TiO_2 is possible depending on particle size and oxidation as well as reduction temperature. Analysis of all solid phases formed during reaction was made using X-ray diffraction. From these findings it is suggested that preoxidation of ilmenite can help to increase ilmenite reduction. However the role of solid geometry, reaction kinetics, and the associated transport resistance still need to be clarified.

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REFERENCES:

1. Davis, H., Lunar Oxygen Impact on STS Effectiveness, Eagle Engineering Report #EE1 83-63 May 1983.
2. Erstfeld, T.E., Williams, R.J., et al., Extraction Processes for the production of Al, Ti, Fe, Mg, and O from Nonterrestrial Sources, In Space Resources and Space Settlements, NASA SP-428