

Current technologies and perspective of in-situ resource utilization on Moon for oxygen extraction using ilmenite

Ingale Gayatri Udaysinh^{1,2}, 정재용¹, 양창원¹, 이은도^{1,2,†}

¹한국생산기술연구원 청정에너지시스템부문, 한국에너지기술연구원 FEP 융합연구단;

²University of Science and Technology

(uendol@kitech.re.kr[†])

Moon is the Earth's only natural satellite and the closest astronomical body to Earth. The use of in-space materials as a feed for life support and propulsion has received significant attention in recent years. The trace of water at the lunar poles by Chandrayaan-1 (ISRO) in 2008-09 has boosted interest in the utilization of local resources. However, the lunar samples received through Apollo and Luna missions found the absence of free oxygen and water. The lunar regolith contains approximately 40- 45 wt% oxygen, in the form of oxides. All of the major iron-bearing phases in lunar soil release oxygen, with differing degrees of efficiency. The mineral ilmenite (FeTiO₃) has the highest susceptibility to reduction with hydrogen. In-situ resource utilization of ilmenite has been proven to be a useful feedstock for oxygen production via fixed or fluidized bed solid-gas reactor system. By heating this material to temperatures above 900°C and exposing it to hydrogen, oxygen can be produced which is feasible for future applications. The present study focuses on the technical and futuristic aspects of lunar oxygen production which will allow human existence on the moon surface.