Various high temperature chemical processes have been developed to extract oxygen and metals from lunar regolith. These processes are tested using terrestrial analogues of the regolith. But all practical terrestrial analogs contain H2O and/or OH-, the presence of which has substantial impact on important system behaviors. We have undertaken studies of lunar regolith simulants to determine the limits of the simulants to validate key components for human survivability during sustained presence on the moon. Differential Thermal Analysis (DTA) yields information on phase transitions and melting temperatures. Thermo-Gravi metric Analysis (TGA) with Fourier transform Infrared (FTIR) analysis of evolved gas species and their evolution temperature profiles. The DTA and TGA studies included JSC-1A fine, NU-LHT-2M and its proposed feedstocks: anorthosite; dunite; HQ (high quality) glass and the norite from which HQ glass is produced. As an example, the DTA and TGA profiles for anorthosite follow. The DTA indicates exothermic transitions at 355 and 490°C and endothermic transitions at 970 and 1235°C. Below the 355°C transition, water is lost accounting for approximately 0.1% mass loss due to water removal. Just above 490°C a second type of water is lost, presumably bound in lattices of secondary minerals along with other volatile oxides. Limited TGA-FTIR data is available at the time of this writing. For JSC-1A fine, the TGA-FTIR indicates at least two kinds of water are evolved in the 100-500 and the 700-900 °C ranges. Evolution of carbon dioxide types occur in the ranges 250-545, 545-705 and 705-985 °C ranges. Geologically, the results are consistent with the evolution of “water” in its several forms, CO2 from break down of secondary carbonates and magmatic, dissolved gas and glass recrystallization.