

Lunar Simulant and ZAP's Plasma

Lunar simulants are a critical aspect of the return to the moon and the planned lunar outpost. All mechanical equipment, chemical processes and human health studies will be tested extensively with simulants prior to deployment. Many believe returning to the moon is a critical step for deep space exploration. Technology developed and used on the moon will be applicable to other planetary exploration. ZAP's plasma process provides an extremely high temperature source that melts mineral material. The plasma can concentrate 1 Megawatt of energy in the size of basketball. The extreme high temperatures allow elements to be reacted in much the same way as minerals were formed on Earth as is commonly believed in scientific communities.

NU-LHT (NASA - USGS – Lunar Highlands Type simulant) is a significant fidelity over previous simulants. NU-LHT is a simulant designed to represent the lunar highlands area that contains a complex mixture of

- Glass
- Agglutinate
- Jagged particulates
- Synthetic Minerals
- Natural Minerals from select terrestrial sources.

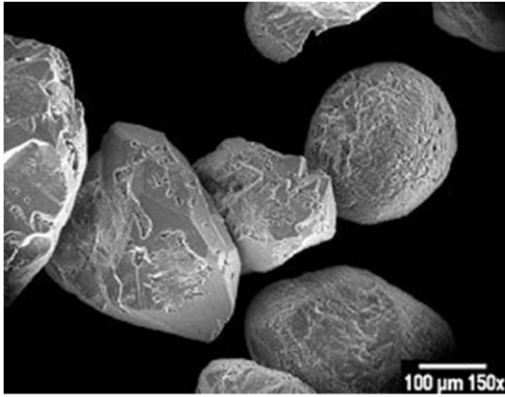
Structure

ZAP has manufactured Lunar Simulant Glass, Agglutinate, Melt Breccia, Recrystallized Rock.

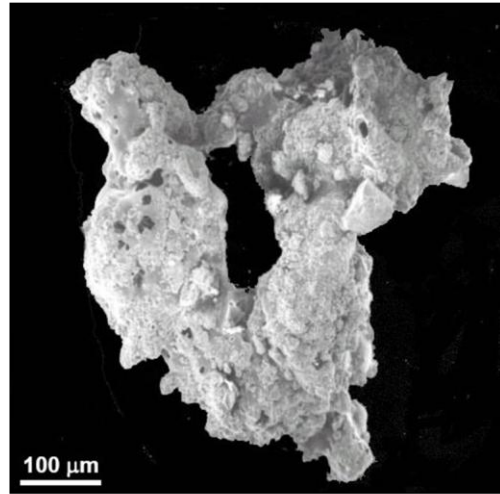
Lunar surface material is composed of basically three microscopic structures: glass, agglutinate, crystal. Glass and crystal structures exist terrestrially. However, the agglutinate structure is not available on Earth.



Agglutinates exist partially because there is no weathering on the Moon. The moon is under constant bombardment from micrometeorites. The meteoric collisions transfer intense thermal and kinetic energy onto the lunar surface. The surface is exposed to extreme cold. The thermal history produced by the impact's intense heat immediately followed by extreme cold is replicated with Zybek Advanced Products' specialized agglutinate reactor. The lack of atmosphere on the moon influences the microscopic structure of the regolith. On Earth, weathering (wind, water) softens and rounds common beach sand (see photo). On the Moon, the particles are produced via meteoric impact. The Apollo sample is shown below in comparison to common beach sand. The small jagged (high surface area) particle structures cause extreme mechanical stress on lunar equipment and health concerns.



Beach Sand



Apollo Sample
Source: NASA

The entire surface of the Moon is covered by 2-30+ meters of regolith(soil) produced by impacting and space “weathering”. ZAP’s plasma reactor models the formation of lunar structures by reproducing the energy density, temperature and subsequent thermal gradient as on the Moon. The average micro-meteoroid imparts 385KJ of energy with a speed of 100,000 km/hr (28,000m/s) and mass of 0.001kg. This equates to 90% thermal equilibrium in 1 second or 347 KW. ZAP’s plasma provides similar thermal history. Energy density, temperature and thermal gradient are used to produce agglutinates by ZAP.