

Water in the Interior of the Moon

Amit Basu Sarbadhikari

Physical Research Laboratory, Ahmedabad 380009, India

(Email: amitbs@prl.res.in)

The post-Apollo view is that the Moon is a "bone dry" body. However, infrared mapping by the Moon Mineralogy Mapper on Chandrayaan-1 resulted in the detection of hydroxyl (OH) and water on the uppermost few millimetres of the lunar surface. The detection of magmatic water in lunar samples has provided the first definitive evidence for the accretion and retention in the Moon's interior of one of the most volatile compounds in the solar system. These surprising results, the culmination of over four decades of intensive geochemical dowsing, provide a severe constraint on high-temperature models that seek to explain the formation and evolution of the Moon.

Water is a resource that could be incredibly valuable for future long-term missions on the Moon and other planetary bodies. The sources of lunar water can be either external or internal or both. From the orbit, water content derived from M^3 spectra indicates numerous locations of increased water content are associated with previously recognized pyroclastic deposits, which ranges the area from thousands of square kilometres to much smaller deposits. The indigenous water has been also reported from the returned lunar samples, e.g., volcanic glasses, olivine-hosted melt-inclusions in volcanic glasses, apatite in mare basalts and plagioclase in highland samples. The derived water content from the various lunar materials are different. The apatites analysed in the lunar mare basalts have 1000's of ppm of water. On the other hand, the volcanic glasses contain one order less abundance of water, while the lunar plagioclase from highland samples contains the least amount (only few ppm). All these point to the heterogeneous distribution of water in the lunar interior. This difference must have roles in the magma evolution and eruption on the Moon. The extraction of water from the Moon needs an extensive prospecting, which in turn depends on the thorough understanding of the physical and chemical processes that the Moon has experienced throughout its evolution.