Crystallinity of Apollo 14 Zircon

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Zircon resists chemical and physical alteration, which permits the use of the mineral to decipher the compositional history of the crust of planetary bodies. Our research employs lunar zircon to gain a better understanding of the Moon, specifically the water content of its crust. We are working with 20 zircons mounted in epoxy from the lunar breccia 14311 and soil sample 14163, with $^{207}Pb/^{206}Pb$ ages that range from 4.30 to 3.93 Ga.

Key to our understanding are the assumptions that the grains we are studying both are crystalline and are zircon rather than a different polymorph of $ZrSiO_4$. We therefore used electron backscatter diffraction (EBSD) to confirm the identity of the zircons and establish crystal orientation. We then turned to Raman spectroscopy to investigate the crystallinity of each grain. We measured spectra on each grain as well as ~20 spectra traverses across five of the grains with plans to finish the set. We document variable intragrain crystallinity, and preliminary results show most of the grains to contain OH as determined by Raman scattering in the 3000 to 4000 cm^{-1} range.

We plan to continue our research with cathodoluminescence analysis to search for chemical zoning in the zircons. To augment the OH measurements by Raman, we will conduct Fourier-transform infrared spectroscopy (FTIR) analysis of individual crystals grains. We are not aware of any previous measurements of OH in lunar zircon conducted by FTIR, and it is therefore our hope that these data will help to shape understanding of the lunar crust and its water content.