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In Situ Sub-cm Chemistry for Assessing Ancient Habitability on Mars with the Alpha Particle X-ray Spectrometer[1] SCOTT VANBOMMEL, RALF GELLERT, University of Guelph, JEFF BERGER, University of Western Ontario, LUCY THOMPSON, University of New Brunswick, JOHN L. CAMPBELL, University of Guelph, KEN EDGETT, Malin Space Science Systems, MARIE MCBRIDE, Purdue University, APXS TEAM, MAHLI TEAM — The Alpha Particle X-ray Spectrometer (APXS) is a chemical analysis instrument on board NASA's Mars rovers. Mounted at the end of the rover arm, the APXS conducts high-precision in situ measurements of rocks and regolith, playing a significant role in understanding the surface composition and geochemical processes on Mars. Curium-244 sources provide complementary PIXE and XRF excitation resulting in a slowly varying and high sensitivity across the range of geochemically important elements with the added benefits of low power demand, low mass, and robust durability. We combine oversampled APXS data with pictures from the arm-mounted MAHLI camera to produce a 3D model of the target and deconvolve the sub-cm-scale chemistry of visible endmembers within heterogeneous targets. Quantitative chemistry at these small scales is perfectly tailored for deconvolving chemical differences in the rock record that resulted from aqueous processes, particularly the fluid mobilization of biologically essential elements such as P, S, and Zn. This is critical for understanding the history of ancient Mars and contributes to Curiosity's quest to discover past habitable environments on Mars.

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