

Hindsight 2020: The Challenges of X-ray Spectroscopy on Mars.

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Three generations of the Alpha-Particle-X-ray-Spectrometer (APXS) have been part of the science suite on all four NASA Mars rovers. Using x-ray spectroscopy following excitation with alpha particles and x-rays from ^{244}Cm sources, so far about 1200 samples have been investigated along the combined traverse of ~75km on the surface of Mars.

Recent results from the ongoing Curiosity and Opportunity rover missions will be discussed, emphasizing the enormous value of bulk chemistry information achievable with the APXS. Additionally, some very successful applications and investigations that were serendipitously developed after launch will be reviewed.

A significant part of the presentation will be devoted to the unique challenges, limitations and required trades between engineering constraints and scientific design. Lessons learned from concepts, fabrication, pre-launch testing and long term operations on Mars over the last decade will be discussed.