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Earth, soil and environmental science research facility at sector 13 of the Advanced Photon Source: II. scientific program and experimental instrumentation

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The GSECARS (APS sector 13) scientific program will provide fundamental new information on the deep structure and composition of the Earth and other planets, the formation of economic mineral deposits, the cycles and fate of toxic metals in the environment, and the mechanisms of nutrient uptake and disease in plants. In the four experimental stations (2 per beamline), scientists will have access to three main x-ray techniques: diffraction (microcrystal, powder, diamond anvil cell, and large volume press), fluorescence microprobe, and spectroscopy (conventional, microbeam, liquid and solid surfaces). The high pressure facilities will be capable of x-ray crystallography at P > 360 GPa and T~7000 K with the diamond anvil cell and P~25 GPa and T~2500°C with the large volume press. Diffracto-meters will allow study of 1 micrometer crystals and micro-powders. The microprobe (1 micrometer focused beam) will be capable of chemical analyses in the sub-ppm range using wavelength and energy dispersive detectors. Spectro-scopy instrumentation will be available for XANES and EXAFS with microbeams as well as high sensitivity conventional XAS and studies of liquid and solid interfaces. Visiting scientists will be able to set up, calibrate, and test experiments in off-line laboratories with equipment such as micromanipulators, optical microscopes, clean bench, glove boxes, high powered optical and Raman spectrometers.