Advanced high-resolution integrated optical system for diamond anvil cell studies

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Keywords: raman spectroscopy, laser heating, diamond anvil cell

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Raman and optical spectroscopy in-situ at extreme high pressure and temperature conditions relevant to the planets' deep interior is a resourceful tool for characterization of a wide range of properties of minerals essential for understanding the structure, composition, and evolution of terrestrial and giant planets. The variety of different materials studied under such extreme conditions is therefore seemingly endless, calling for the need for such a versatile optical system.

The optical system consists of five Raman excitation lines (266, 473, 532, 660, and 946 nm) as well as Coherent Anti-Stokes Raman Spectroscopy (CARS)[1] and double sided IR laser heating capabilities[2]. Users can alternate between different configurations remotely, avoiding sample specific problems such as fluorescence by changing the excitation wavelength. In addition to excitation choice, samples can be mapped utilizing motorized control of the sample. The integrated system is mainly software controlled, making it user-friendly and safe.

Here we show the completed construction on a conceptually-new, user-friendly, integrated system for worldwide users at the Advanced Photon Source (APS) Sector 13 combining advanced Raman and optical spectroscopy tools adopted for studies of materials *in-situ* at static and dynamic extreme P-T conditions in the diamond anvil cell and newly synthesized materials at ambient conditions with a high spatial resolution.

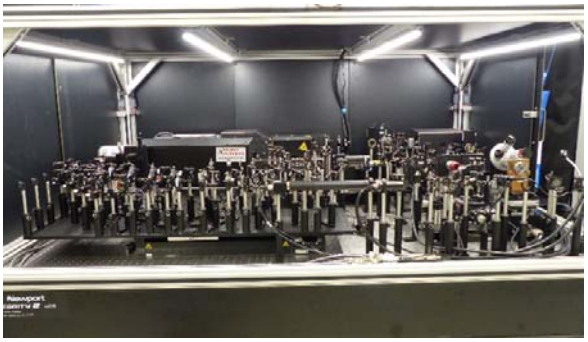

Figure 1. Photograph of the optical system at APS Sector 13.

Acknowledgments: This work was supported by NSF MRI proposal (EAR-1531583) and DOE – Geosciences (DE-FG02-94ER14466).

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