

Using advanced accelerators to understand the lower mantle and beyond

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Advances in measurement techniques and methodologies largely drive advances in our understanding of the natural world. This is particularly true for the case of high-pressure research. Advances in pressure cell technologies have allowed us to move from the kilobar to Megabar regimes, with simultaneous temperatures rising from a few hundred Kelvin to many thousand, opening up new fields of research in the fields of physics, chemistry and materials science. In parallel with this developments in x-ray sources have seen us moving from identifying simple phases and measuring lattice parameters to determining atomic structure and elastic properties of materials at high-pressure and temperatures. In this talk we will outline the progress we have made over the last twenty years of development of high-pressure x-ray studies; starting with examples from second generation synchrotron sources and moving on to describe the state of the art high-pressure diamond anvil cell with laser heating facility at the third generation Advanced Light Source [1]. Examples of using these facilities will be in the context of our understanding of the core mantle boundary [2]. We will also describe our plans for using the next generation of accelerator based light sources, free electron lasers, for studies of materials under shock compression [3].

References

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