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Synchronizing flash-melting in a diamond cell with synchrotron X ray diffraction (XRD) AMOL KARANDIKAR[1], REINHARD BOEHLER, Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Road NW, Washington, DC 20015, USA, YUE MENG, ERIC ROD, GUOYIN SHEN, HPACAT, Geophysical Laboratory, Carnegie Institution of Washington, Argonne, Illinois 60439, USA — The major challenges in measuring melting temperatures in laser heated diamond cells are sample instability, thermal runaway and chemical reactions. To circumvent these problems, we developed a "flash heating" method using a modulated CW fiber laser and fast X ray detection capability at APS (Pilatus 1M detector). As an example, Pt spheres of 5micron diameter were loaded in a single crystal sapphire encapsulation in the diamond cell at 65 GPa and heated in a single flash heating event for 20ms to reach a desired temperature. A CCD spectrometer and the Pilatus were synchronized to measure the temperature and the XRD signal, respectively, when the sample reached the thermal steady state. Each successive flash heating was done at a higher temperature. The integrated XRD pattern, collected during and after (300K) each heating, showed no chemical reaction up to 3639K, the highest temperature reached in the experiment. Pt111 and 200 peak intensity variation showed gradual recrystalization and complete diminishing at about 3600 K, indicating melting. Thus, synchronized flash heating with novel sample encapsulation circumvents previous notorious problems and enables accurate melting temperature measurement in the diamond cell using synchrotron XRD probe.

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