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Materials under Extreme Conditions: Their Crystalline Structures by X-Ray Diffraction with the Use of Synchrotron Radiation. Serge Desgreniers, Laboratoire de physique des solides denses, Ottawa-Carleton Institute of Physics, Univ. of Ottawa, Ottawa, Ontario, Canada. K1N 6N5.

The advent of third-generation synchrotron radiation sources has contributed significantly to the essor of physics of materials under extreme conditions. In this presentation, I will review recent developments in techniques for the generation of very high pressures and temperatures on materials and the use of high brilliance synchrotron light to probe the crystalline state of condensed matter by X-ray diffraction. Following a general introduction on the physics of materials subjected to extreme pressures and temperatures, I will concentrate on recent studies of the crystalline structures of high-density phases of materials carried out by X-ray diffraction techniques using synchrotron radiation. Results are discussed for dense phases of “guest-host” systems like gas hydrates and alkali metal-Group IV element clathrates, as well as simple molecular systems like solid oxygen. I will then conclude with a discussion of prospects for a structured program of science at extreme conditions at the Canadian Light Source.