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Physical and chemical transformations of iron pentacarbonyl under pressure[1] YOUNG YAY RYU, Institution for Shock Physics, Department of Material Science and Engineering and Department of Chemistry Washington State University, CHOONG SHIK YOO[2], Washington State University — We have studied the physical and chemical transformations of iron pentacarbonyl ($Fe(CO)_5$) in externally-heated diamond anvil cells using *in situ* micro-Raman and synchrotron x-ray diffraction. Raman spectra of $Fe(CO)_5$ are most characteristic to three different solid polymorphs and a polymeric solid found at high pressure-temperature condition, yielding the phase/chemical transformation diagram to 650 K and 20 GPa. The spectral results, for example, reveal that liquid $Fe(CO)_5$ undergoes several phase transformations to metastable solid phase I at 0.3 GPa, phase II at 1.5 GPa, and phase III at 4.8 GPa that polymerizes above 16 GPa. The X-ray diffraction data support the phase transitions that were observed in the Raman spectroscopy. These polymorphs also exhibit distinctive crystal morphology and optical properties, which will be discussed in this paper.

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