High-pressure x-ray diffraction and Raman scattering studies of Pb(Mg$_{1/3}$Nb$_{2/3}$)O$_3$-xPbTiO$_3$\(^1\) MUKHTAR AHART, MADDURY SOMAYAZULU, RONALD COHEN, RUSSELL HEMLEY, Geophysical Laboratory, Carnegie Institution of Washington — Motivated to determine and understand the compositional-pressure phase diagram for PMN-xPT solid solutions, we employed the angular dispersive x-ray diffraction methods (Advanced Photon Source, Argonne National Laboratory) and high pressure Raman scattering to investigate a series of PMN-xPT solid solutions (x=0.2, 0.3, 0.33, 0.35, 0.37, 0.4) in a diamond anvil cell up to 20 GPa. The x-ray diffraction results show changes in Bragg peaks at about 6 or 7 GPa which indicate that PMN-xPT systems undergo a ferroelectric to a paraelectric phase transition. In addition, a new peak centered at 380 cm\(^{-1}\) appears above 6 GPa for all the samples. The morphotropic phase boundary (x=0.33 to 0.37) with the monoclinic symmetry persists up to 7 GPa. Based on our results, we suggest a possible structure for high pressure phase, which is R3c. We suggest a phase diagram for PMN-PT system which is slightly different from the one predicted by B. Chaabane et al (Phys. Rev. B 70, 134114, 2004).

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