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Solubility of indium probe atoms in supercooled gallium liquid metal between 8K and 300K[1] XIANGYU YIN, RANDAL NEWHOUSE, JOHN BEVINGTON, GARY COLLINS — Liquid gallium samples were made that remain supercooled down to 8 K. Perturbed angular correlation (PAC) measurements were made over the range 8-293 K to determine nuclear quadrupole interactions at 111In/Cd probe atoms doped into the gallium at the part-per-billion level. Near 295 K, the PAC spectrum exhibits a signal with a constant anisotropy (signal 1) for nearly all Cd probes that is consistent with extreme motional averaging of electric field gradients. This is typical of probe atoms dissolved in liquids. Cooling below 295 K, signal 1 is progressively replaced by a high-frequency, broadly-distributed quadrupole interaction signal (signal 2) that is attributed to probe atoms adhering to bounding walls of the gallium drop. The changes are reversible and attributed to changes in the terminal solubility of solutes in gallium with temperature. The observed fractions of indium in solution were approximately 100% at 295 K, 50% at 283 K, 15% at 140 K and 10% at 73 K.

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