

Xe agglomerates confined in a Si matrix by ion implantation were synthesized with different size depending on the implantation process and/or the thermal treatment. At low temperature Xe nanocrystals are formed, whose expansion and melting were studied in the range 15-300 K. Previous high resolution x-ray diffraction spectra were corroborated with complementary techniques such as two-dimensional imaging plate patterns and transmission electron microscopy. We detected fcc Xe nanocrystals whose properties were size dependent. The experiments showed that in annealed samples epitaxial condensation of small Xe clusters, on the cavities of the Si matrix, gave in fact expanded and oriented Xe, suggesting a possible preferential growth of Xe (311) planes oriented orthogonally to the Si[02-2] direction. On the contrary, small Xe clusters in an amorphous Si matrix have a fcc lattice contracted as a consequence of surface tension. Furthermore, a solid-to-liquid phase transition size dependent was found. Expansion of fcc Xe lattice was accurately determined as a function of the temperature. Overpressurized nanocrystals and/or binary size distributions were disproved.

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