Large scale arrays of $Fe_{60}Al_{40}$ nanomagnets generated by ion irradiation

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Large-scale periodic arrays of trigonal ferromagnetic islands embedded in a paramagnetic matrix have been fabricated by deposition of polystyrene nanospheres on 40 nm thick B2-$Fe_{60}Al_{40}$ thin films. Subsequently, the system was irradiated by Ne^+ ions in 30 – 130 keV range at $6x10^{14}$ cm^{-2} fluence, which induced chemical disorder and thus a ferromagnetic phase in the uncovered $Fe_{60}Al_{40}$.
Changes in coercive field, saturation magnetization, and magnetic anisotropy constant have been determined in a temperature range of 5 K – 350 K and correlated with the radiation damage obtained from simulations. The domains and the switching behaviour were studied by SMRM. The results demonstrated that the proposed approach can be used to produce large-area magnetic arrays embedded within a flat surface with magnetic properties tuneable by temperature and patterning period.

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