Formation mechanism of Fe nanocubes in magnetron sputtering inert gas condensation chamber was reported previously [1]. In the recent study [2], considering that nucleation happens within a short distance from the sputtering target, we utilize the high-permeability and resultant screening effect induced by magnetic Fe targets of various thicknesses to manipulate the magnetic field configuration and plasma confinement. We can switch from bimodal to single-Gaussian size distributions of Fe nanocubes by modifying their primordial thermal environments, as explained by a combination of modelling methods. Simultaneously, we obtain a material yield increase of more than one order of magnitude compared to experiments using post-growth mass filtration. We further demonstrate the unprecedented NO$_2$ detection performance for Fe-based chemoresistive gas sensors by the deposition of Fe nanocubes on microhotplate devices.

Figure 1: Bimodal size distribution of Fe nanocubes depends on the thickness of ferromagnetic targets
