

## Soft Magnetic Properties of Fe-Ni Clusters Assembled Films Prepared by Energetic Cluster Depositions

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### Abstract:

Using plasma-gas-condensation cluster deposition systems we have prepared Fe-Ni alloy cluster assembled films. The packing densities of these films with applying a high electric bias voltage (about 20 kV) to the substrates are about 85 % of bulk Fe-Ni alloys and much higher than those of conventional Fe-Ni cluster assembled films (30-40% of bulk Fe-Ni alloys) without applying a bias voltage to the substrates. The saturation magnetizations of dense Fe-Ni cluster assemblies are also about 85% of bulk Fe-Ni alloys. Moreover, the real part of magnetic permeability,  $\mu'$ , are about 200 even at the frequency range of 1 MHz, and the imaginary part of magnetic permeability,  $\mu''$ , increases with the frequency above 1 MHz, i.e., the ferromagnetic resonance frequency is higher than 1 MHz.

When the surfaces of Fe-Ni clusters are slightly oxidized by introduction of O<sub>2</sub> gas into the sputtering chamber and similarly deposited by applying bias voltages to the substrate, the saturation magnetization decreases, however, the  $\mu'$  values are maintained about 100 above 3 MHz and the ferromagnetic resonance frequency becomes higher than 3 MHz.