

Optimization of Magnetic Multilayer Device and Nanosensor Performance Using Low-Energy Helium Ion Irradiation

Magnetic multilayers and their integration into nanostructured devices are crucial for modern spintronics and high-precision sensing. Achieving optimal device performance demands precise control over their structural and functional characteristics. This work investigates low-energy helium ion irradiation as a technique to enhance the performance of these devices.

Controlled helium ion irradiation demonstrably altered key device metrics in magnetic multilayer structures. Irradiation-induced nanoscale defects and atomic rearrangements directly impacted interfacial quality, magnetic anisotropy and electrical conductivity.

In nanostructured sensor devices (specifically nanocapacitors), irradiation similarly improves performance characteristics of the nanosensor such as sensitivity, stability and signal resolution.

Crucially, these performance enhancements were achieved without significant degradation of device integrity.

In conclusion, we will show how low-energy helium ion irradiation presents a promising non-invasive and scalable method for precise tuning of magnetic multilayer devices and nanosensors. The observed improvements in key device metrics pave the way for significant advancements in spintronic technologies and high-performance sensing applications.