

Epitaxial Growth of MgO and CoFe/MgO on Ge(001) Substrates by Molecular Beam Epitaxy

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We report the epitaxial growth of MgO and CoFe/MgO on Ge (001) substrates using molecular beam epitaxy. It was found that the epitaxial growth of a MgO film on Ge could be realized at a low growth temperature of 125 ± 5 °C and the MgO matches the Ge with a cell ratio of $\sqrt{2}$:1, which renders MgO rotated by 45° relative to Ge. In-situ and ex-situ structural characterizations reveal the epitaxial crystal growth of bcc CoFe/MgO on Ge with the in-plane crystallographic relationship of $\text{CoFe}(001)[100] \parallel \text{MgO}(001)[110] \parallel \text{Ge}(001)[100]$, exhibiting sharp interfaces in the (001) matching planes. The saturation magnetization of the sample is 1430 ± 20 emu/cc, which is comparable to the value of bulk CoFe.

Key words: Ge, MgO, Molecular beam epitaxial growth, Lattice matching epitaxy, Domain matching epitaxy, In-situ RHEED analysis