

# Energy Product and Coercivity of Rare-earth free Multilayer and Bilayer FeCo/FePt and FeCo/AuCu Exchange Spring Magnet

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Using the full potential linearized augmented plane wave (FLAPW) method, we have explored the energy product and the coercivity of rare-earth free FeCo/FePt (001) multilayered exchange spring magnet, bilayer FeCo/FePt and FeCo/AuCu systems. A giant perpendicular magnetocrystalline anisotropy energy ( $E_{MCA}$ ) is observed in multilayer and bilayer FeCo/FePt systems. For instance, an  $E_{MCA}$  of 27.24 meV/cell is found in FeCo(9ML)/FePt(5ML) multilayer structure. Besides an energy product of 82 MGOe and coercive field of 130 kOe was obtained for FeCo(9ML)/FePt(5ML) multilayer structure. In bilayer Feco (2ML)/FePt(4ML) system a very high value of uniaxial anisotropy constant of  $9.8 \text{ MJ/m}^3$  was obtained along with a 74 MGOe maximum energy product and coercive field of 143 kOe. In bilayer FeCo(5ML)/AuCu(5ML) we have obtained a uniaxial anisotropy constant of  $0.98 \text{ MJ/m}^3$ . Additionally, the estimated coercive field and maximum energy product for this system are 24.7 kOe and 25 MGOe. Both energy product and coercive field stated above imply that these systems can be utilized for potential rare-earth free permanent magnet.