INTERPRETATION of SWR SPECTRA in Fe/Ni MULTILAYERS: IDENTIFICATION of SURFACE/INTERFACE MODE LINES

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9.7 cm

A theory of spin wave resonance (SWR) is developed here for two-component ABAB$\cdots$ ferromagnetic multilayer. This theory deals with any asymmetrical spin pinning conditions (originating in surface anisotropy) on multilayer external surfaces. The interface conditions are satisfied by taking into account an effective exchange field expressed by interface gradients of the exchange constant and the magnetization. A dynamic dipolar interaction field, appropriately expressed by magnetization transversal components, is introduced into Landau-Lifshitz phenomenological equations of motion, which are solved numerically using the transfer matrix method. This approach provides an easy way to find frequencies and amplitudes of standing spin waves in the multilayer. The developed theory is applied to interpretation of SWR spectra obtained experimentally in two systems, a bilayer Fe/Ni and a trilayer $Ni/Fe/Ni$, in perpendicular (to the multilayer surface) configuration of the external field (J.S.S. Whiting, 1988). By fitting the SWR spectra obtained experimentally and those found numerically, the surface anisotropies are estimated on both multilayer surfaces; then, the nature of the observed resonance lines is identified, respectively, as associated with bulk, surface or interface modes. Thus, our theory can be used to identify the nature of the SWR lines obtained experimentally in a given multilayer. The theory can also be extended to a general case of any multi-component layered system.

13.4 cm

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