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Electronic and Magnetic Properties of *3d* Transition Metal Alloy Films on W(110)

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We investigate the correlation between the change of magnetic properties and structural transition for *3d* transition metal alloy ($Fe_{1-x}Ni_x$, Fe1-xCox, $Fe_{1-x}V_x$, and $Co_{1-x}V_x$) films, which were grown on W(110) substrate usingTo clarify the correlation clearly among the electronic structure, magnetic properties, and structural transition as a function of alloy composition, we performed the spin-summed and resolved photoemission spectra (SSRPES) and low energy electron diffraction (LEED).

Epitaxial Fe-rich alloy films of formula $Fe_{1-x}Ni_x$, $Fe_{1-x}Co_x$, and $Fe_{1-x}V_x$ were grown on a W(110) substrate with a bcc structure without any structural transition at $x < 0.3$. Using *chemical pressure* (inserting small amounts of Ni, Co, or V into Fe), we controlled the lattice constant of these alloy films and then measured the variation of spin reorientation thickness (t_r) according to the alloy composition. We focused on the roles of lattice constant of the film and the spin reorientation thickness that is closely related to the strain associated with the lattice mismatch between the thin film and the substrate.

The electronic and magnetic properties of $Co_{1-x}V_x$ films have been investigated as a function of V content (x). These films maintain epitaxial conditions for all V concentrations, in spite of the structural phase transition (hcp/bcc at x = 40 %). The transition from ferromagnetic to paramagnetic phase occurs in the Co-rich, hcp phase at x = 33 %. In ferromagnetic phase, V is coupled antiferromagnetically to the Co. This behavior, typical of ferromagnetic binary alloys with an early transition metal, is explained and clarified by the evolution of the electronic structure of the valence band as monitored by spin-resolved photoemission.