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Unoccupied Metallic Quantum Well States and CO Adsorption on Ni/Cu(100) HUA YAO, Rutgers University, ANTHONY DANESE, Rutgers University, ROBERT BARTYNSKI, Rutgers University — When ultrathin metal films are grown on metal surfaces, reflection at the interface and at the film surface give rise to so-called metallic quantum well (MQW) states in the valence levels. The Cu/Ni/Cu(100) system is anomalous in that occupied MQW states in the Cu overlayer disperse upwards with increasing overlayer thickness, while the Cu-induced features seen in inverse photoemission (IPE) disperse downward. To better understand the origin of this phenomenon, we performed an IPE study of the Ni/Cu(100) and CO/Ni/Cu(100) systems as a function of Ni thickness. For thin Ni layers, the film grows pseudomorphically, while for thicker layers the Ni relaxes to its bulk lattice parameter. IPE spectra from Ni films up to 10 ML exhibit two features that increase in energy with increasing Ni thickness. CO adsorption strongly modifies the spectrum indicating that one feature is a Ni surface resonance while the other is a state confined to the Ni/Cu interface. In the range from 10 ML to 20 ML, the spectra exhibit a single strong feature, similar to Ni(100) surface but at a higher energy, which also appears dominated by the surface resonance. Above 20 ML the energy of the feature returns to the value for Ni(100) and the spectrum is only weakly affected by CO. Our results suggest that the Ni surface resonance and the Cu/Ni interface state play key roles in the anomalous dispersion of the unoccupied states in the Cu/Ni/Cu(100) system.

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