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Effect of strain on the chemisorption of CO on ultrathin Ni films on a Cu(001)

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The chemisorption of CO on ultrathin epitaxial Ni films on a Cu(001) surface was investigated by high resolution electron energy loss spectroscopy (HREELS).

CO molecules adsorb on both on-top and bridge sites of the Ni film at room temperature(RT) as is the case on a bulk terminated Ni(001). The vibration energies of CO stretching modes on both sites monotonically increased and grew beyond those on a Ni(001) surface with increasing Ni thickness. The relative population of the two bonding sites gradually changed; the on-top site is prefered by CO for submonolayer Ni coverages while the bridge site is slightly favored for the Ni films thicker than 3 monolayer(ML). We found an existing model, "pillow model", for the strain effect on the vibrational energy incompatible with our spectroscopic results.