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Gold atoms, chains and islands on oxide films: looking at orbitals and counting electrons.

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Low-temperature STM measurements combined with DFT calculations are employed to analyze the adsorption of gold on alumina/NiAl(110). The binding of Au monomers involves breaking of an oxide Al-O bond below the adatom and stabilizing the hence under-coordinated O ion by forming a new bond to an Al atom in the NiAl. The adsorption implies negative charging of the adatom. The linear arrangement of favorable binding sites induces the self-organization of Au atoms into chains. For every ad-chain, the number of electrons, in particular of transfer-electrons from the support, is determined by analyzing the node structure of its HOMO.