

Abstract Submitted
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Quantum Mechanics of Palladium Nanostructures AJIT HIRA, JAMES MCKEOUGH, BRIDGET ORTIZ, JUAN DIAZ, Northern New Mexico College — We continue our interest in the chemisorption of different atomic and molecular species on small clusters of metallic elements, by examining the interactions of H, H₂, Li and O adsorbates with Pd_n clusters (n = 2 thru 20). The study of clusters can reveal the effects of substrate geometry on the behavior of adsorbates. Transition-metal clusters are especially suited for the study of quantum size effects and for formation of metallic states, and are ideal candidates for catalytic processes. Hybrid ab initio methods of quantum chemistry (particularly the DFT-B3LYP model) are used to derive optimal geometries for the clusters of interest. We compare calculated binding energies, bond-lengths, ionization potentials, electron affinities and HOMO-LUMO gaps for the clusters. Of particular interest are the comparisons of binding strengths at the three important types of sites: edge (E), hollow (H), on-top (T), threefold sites and fourfold sites. Effects of crystal symmetries corresponding to the bulk structures are investigated. The capacity of Pd clusters to adsorb H atoms will be compared to Ni clusters. Admixture with Pt atoms will also be considered.

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