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Reactivity of Size-Selected Gas-Phase Transition Metal Sulfide Clusters with CO and NH_3[1] JAMES LIGHTSTONE, MELISSA PATTERSON, Stony Brook University, MICHAEL WHITE, Brookhaven National Lab — Our current focus has been the production of early transition metal sulfide and carbide clusters for reactivity studies in both the gas-phase and deposited on well defined surfaces. The transition metal sulfides are particularly interesting due to their catalytic properties and their ability to form fullerene-like nanostructures that reflect the S-M-S layered structure of the bulk material. Gas-phase $M_xS_y^+$ clusters (M=Mo, Nb, Ta, W) were produced in a cluster deposition apparatus by reactive sputtering via a magnetron cluster source. Mass spectroscopy results show that Mo, Ta, and W preferentially produce clusters of similar stoichiometry (x/y = 2/6, 3/7, 4/6, 5/7, and 6/8) while all the metals are found to form the "magic" cluster, $M_4S_6^+$. Several prominent $M_xS_y^+$ clusters in the mass spectra were size-selected and reacted with CO and NH_3 in a hexapole collision cell. In general, CO adsorbs sequentially on exposed metal sites, while the results for NH_3 appear to suggest the formation of solvation shells. These results and how they may relate to cluster structure and reactivity will be discussed. In addition, we will discuss current progress towards deposition of these nanomaterials on well-defined substrates.

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