ELECTRON SPIN RESONANCE INVESTIGATIONS OF MATRIX ISOLATED METAL CLUSTERS AT 4 K

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High-spin magnesium and calcium neutral clusters and zinc cluster radical cations were isolated in neon matrices at 4 K and studied by ESR spectroscopy. Solid magnesium, calcium, and zinc were vaporized in a resistively heated tantalum Knudsen cell and co-deposited with neon or argon on a copper flat at 4 K. High-spin neutral metal clusters were observed for both magnesium ($^3\Sigma$) and calcium ($^5\Sigma$). Experimental values for the fine structure interactions (D-tensor) were determined by fitting the observed fine structure lines to those obtained from an exact diagonalization of the spin Hamiltonian. Due to the large proportion of p-orbital contribution, no hyperfine interactions were resolved. In these experiments, zinc cluster cation radicals were also generated by X-irradiation of matrix isolated zinc clusters. Experimental values of the nuclear hyperfine interactions (A-tensor) for $^{67}Zn_n^+$ (n = 1-4) radicals were determined. Small shifts observed in g-values demonstrate some d-orbital contribution to cluster bonding.