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Electric dipole polarizabilities of atomic clusters of Sodium ANTHONY LIANG, University of Southern California, JOHN BOWLAN, Fritz-Haber-Institut der Max-Planck-Gesellschaft, WALTER DEHEER, Georgia Institute of Technology, VITALY KRESIN COLLABORATION — A new discussion of the electronic shell structure of simple metal clusters is presented. Due to size quantization, cluster valence electrons order into energy shells as in atoms. We show that the oscillation of electric dipole polarizability as a function of size for sodium clusters (both in amplitude and shell closing numbers) can be explained by spherical well filling of electron wavefunctions. The shell closing numbers are closely examined. Interestingly, most theories involving cluster shape deformations do not yield the measured amplitude and closing numbers, while an existing simple spherical shape theory has correctly predicts both. This may hint at the occurrence of proposed resonant shape coexistence in nanoclusters. We also discuss the trend of oscillations (again, both in amplitude and shell closing numbers) in measurements of atomic separation energy of sodium clusters, the magnetic moments of nickel clusters, the magnetic moment of the sodium cluster Na69, and photoabsorption of sodium clusters, and point out interesting similarities. It appears that there may be more universal properties originating from shell filling in simple metal clusters than previously observed. The electric and magnetic field deflection measurements were carried out with a 20 K sodium cluster molecular beam apparatus.

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