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Potential for Strong Pairing and High Transition Temperatures in Metallic Nanoclusters AMBER POST, LOUIS BLOOMFIELD, University of Virginia — Studies of atomic clusters containing tens or hundreds of atoms have gained much interest in recent decades because of their potential to bridge the gap between isolated atoms and bulk systems. Notable results include the observation of a shell structure[1] similar to that found in electronic shells of single atoms. Theoretical calculations[2] show that certain levels within this shell structure allow for strong Cooper pairing. These calculations also show that the particular shell levels, which are realistically attainable, have high density of states in the HOS and LUS levels and could show substantially higher values of the superconducting transition temperature T_C than are observed in the bulk material. At temperatures near T_C, the onset of strong pairing can be experimentally observed by an increase in the minimum excitation energy of the particular cluster. Our group will first look for this energy increase in Al clusters at around 90K, the predicted T_C for Al clusters of interest. Here we present a progress report on Al and describe future work.

[1] W. Knight, K. Clemenger, W. de Heer, W. Saunders, M. Chou, and M. Cohen, Phys. Rev. Lett. **52**, 2141 (1984).
[2]V. Z.Kresin and Y. N. Ovchinnikov, Phys. Rev. B **74**, 024514 (2006).

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