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The Image Potential for Spherical Conductors and Dielectrics

GODFREY GUMBS, Hunter College of the CUNY, ANTONIOS BALASSIS, Fordham University, ANDRII IUROV, Hunter College of the CUNY, PAULA FEKETE, United States Military Academy — We calculate the image potential for spherical conductors and dielectrics, such as fullerene buckyballs. Our calculations show that these structures can support electronic states which may be localized at some distance away from the surface. These “spherical image states” exist within extended surface potentials formed by the competition between the attractive image force, the external electron and its image charge in the spherical shell, and the repulsive centrifugal force arising from the angular motion. The effective potential leads to extended stable states away from the surface of the spherical shell. At low temperatures, this results in long lifetimes for the image states. We expect that spherical image states with binding energies of a few meV. The bound states may be formed with the aid of radiative recombination.

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