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Assembly and Interaction of Au/C Core-Shell Nanoparticles PETER SUTTER, ELI SUTTER, YIMEI ZHU, Brookhaven National Laboratory — The encapsulation of metal nanoparticles in fullerene cages has attracted much interest recently due to the expected novel and exotic properties. Despite the interest in these nanostructures, important properties, such as the thermal stability and interactions of encapsulated nanoparticles as well as the process of encapsulation itself are not entirely understood. Using real-time transmission electron microscopy we study the formation of Au/C core-shell structures from C-supported Au nanoparticles, and their thermally and electron beam induced interactions [1, 2]. At temperatures below 400C no C-shell is assembled, and closely spaced Au nanoparticles interact by coalescence. At high temperatures (400C - 800C) the Au particles are transformed into Au/C core-shell structures via encapsulation into curved, fullerene-like C shells. The shells initially passivate the Au cores and inhibit their coalescence. But under electron irradiation, the Au cores can break free from their shells, and hence can coalesce. Surprisingly, at this stage the assembled C-sheets may actually enhance the coalescence process by driving the directed motion of Au/C particles and causing the efficient contraction of widely spaced particle ensembles.
[1] E. Sutter, P. Sutter, Y. Zhu, Nano Lett. 5, 2092 (2005).
[2] E. Sutter, P. Sutter, Y. Zhu, Surf. Sci. 600, 3654 (2006).

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