Icosahedron magic -- New forms of the most spherical Platonic solid

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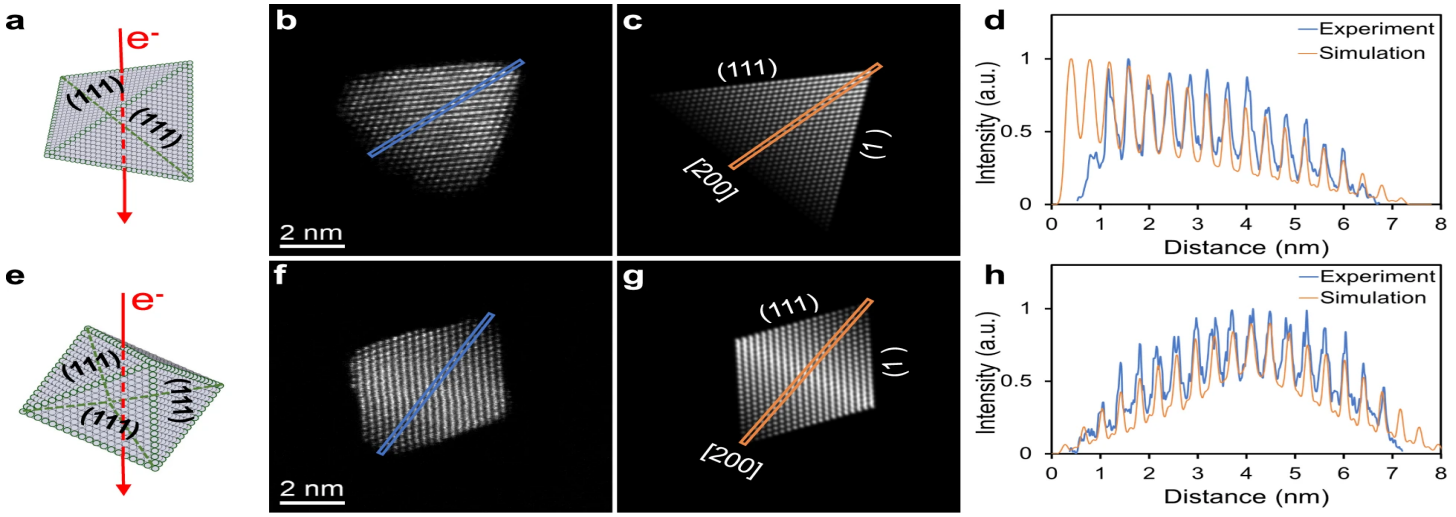
The icosahedron is the Platonic solid that combines the highest degree of symmetry with the most compact shape in terms of surface-to-volume ratio. Icosahedral structures are very common in nature, being observed in nanoparticles, viruses, protein and DNA aggregates, intermetallic compounds and quasicrystals. In spite of their presence in such a wide variety of domains, a general theoretical framework for constructing icosahedra starting from discrete particles is still lacking. After a general introduction to Platonic solids and to their realizations in nanoscale physical systems [1,2], we present a new general method for constructing icosahedral aggregates [3] that combines ideas from solid-state crystallography and virus biology. We demonstrate that icosahedra can be constructed as sequences of concentric shells that are mapped into paths running in the two-dimensional hexagonal lattice. Our method allows to combine chiral and achiral shells in the same structure. The method is applied to the bottom-up design of metal clusters and nanoparticles.

[1] Y. Xia, D. Nelli, R. Ferrando, J. Yuan, Z.Y. Li, Nature Communications 12, 3019 (2021)
[2] D. Nelli, C. Roncaglia, R. Ferrando, Z. Kataya, Y. Garreau, A. Coati, C. Andreazza-Vignolle, P. Andreazza, Nanoscale 15, 18891 (2023)
[3] N. Canestrari, D. Nelli, R. Ferrando, submitted (2024).



Mercoledì 24 Maggio 2024 - ore 10:00
Aula informatica , DIMA - Via Eudossiana 18, Roma
Link Google Meet: meet.google.com/atf-nmwv-jbz

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