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Dense packings of hard spheres from sequential deposition: A route to new architecture in the nano-world

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Abstract

Dense packings of equal-sized hard spheres in cylindrical confinement serve as a model for a variety of quasi-1D systems with spherical entities, such as fullerenes inside nanotubes and colloidal crystal wires. For such hard-sphere systems, our research included (i) the computational prediction of a rich variety of densest possible structures (most of which are helical) as a function of the cylinder-to-sphere diameter ratio, and (ii) the development of a method of sequential deposition for constructing all these densest possible structures. In this talk, I will (i) give an overview of such densest possible structures, (ii) explain how they can be constructed via a sequential deposition of spheres, and (iii) present some novel helical structures as discovered (unexpectedly) from the same deposition method.

Biography

Ho-Kei Chan has developed a method of sequential deposition for constructing the densest possible cylindrical packings of equal-sized spheres [Physical Review E 84, 050302(R) (2011)]. Such structures are found in a variety of quasi-1D systems, such as fullerenes inside nanotubes and colloidal crystal wires. Chan obtained a 1st class degree in Engineering Physics (2002) from the Hong Kong Polytechnic University and a PhD in Nonlinear and Liquid Crystal Physics (2007) from the University of Manchester, followed by post-doctoral research in Hong Kong, Ireland and England. He has published in the fields of packing problems, soft matter physics and conduction problems.