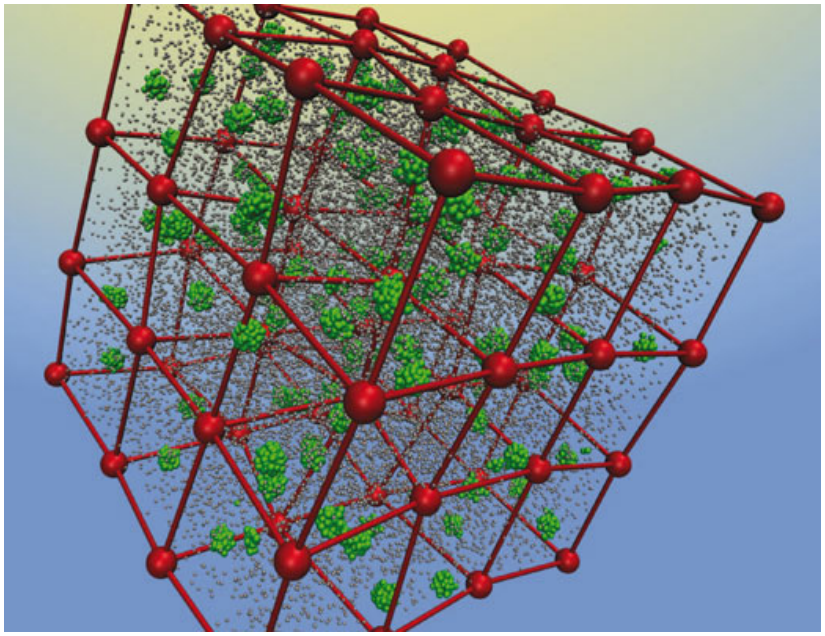
Soft Lego built in the computer

University of Vienna



Barbara Capone of the Computational Physics Group of the University of Vienna has developed a new method for the construction of building blocks at the nanoscale. The researcher in Soft Matter Physics, who works at the group of Christos Likos, Professor for Multiscale Computational Physics, is specialized on topics of self-assembly of materials at the nanoscale and she has published, together with her colleagues, a paper at the prestigious Journal "Physical Review Letters" on "soft Lego."

In developing these novel self-assembling materials, postdoc Barbara Capone has focused on the design of organic and inorganic building blocks, which are robust and can be produced at large scale. Capone has put forward, together with her colleagues at the Universities of Vienna and Mainz, a completely new pathway for the construction of building blocks at the nanoscale.

"Soft Lego" orders in crystal structures
The team of researchers has shown that so-called block copolymer stars – that means polymers that consist of two different blocks and they are chemically anchored on a common point – have a robust and flexible architecture and they possess the ability to self-assemble at different levels. At the single-molecule level, they first order as soft patchy colloids which serve then as "soft Lego" for the emergence of larger structures. At the next level of self-assembly, the colloids form complex crystal structures, such as diamond or cubic phases.

The spatial ordering in the crystals can be steered through the architecture of the "soft Lego" and opens up the possibility for the construction of new materials at the macroscopic scale with desired structure. In this way, crystals can be built that have

applications in, e.g., photonics, acting as filters for light of certain frequencies or as light guides.

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