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Liquid Quasicrystals[1]

GORAN UNGAR, University of Sheffield

Following the discovery of quasicrystals by Shechtman and Cahn in 1984[1], for the following 20 years the new field of QCs was confined to metal alloys and atomic-scale structures. Then, with the discovery of a liquid crystal phase possessing dodecagonal QC symmetry[2]], research interest has extended from metal alloys to those where the motifs were no longer single atoms but assemblies of many molecules. In dendron-based liquid quasicrystals (LQC) between 10-50 molecules form a supramolecular sphere with 10^3 – 10^4 atoms. In 2007 a 2-d quasiperiodic phase was found in three-arm star ABC polymers[3]. In 2012 the first linear diblock copolymer was reported to form a sphere-based bulk QC phase, similar to that in dendrimer LQC but on a still larger scale[4]. In the same year bulk QC domains were reported in "hard" nanoporous silica, produced however, again from a "soft" lyotropic template[5]. The symmetry of all confirmed soft QCs so far is 12-fold. Another important development in soft QCs is the observation of complex QC approximants in a number of side-branched polyphilic LC honeycombs, described by multicolour tilings[6,7]. In fact, recently we found a genuine dodecagonal QC in such systems, the first example of a 2D LQC. Furthermore, we succeeded in direct AFM imaging of the *xy* plane of a dendrimer LQC. The images confirm the "half-step" inflation rule, proposed earlier[7] but not confirmed until now. (1) D. Shechtman, I. Blech, D. Gratias, and J. W. Cahn, *PRL* 1984, **53**, 1951. (2) X.B. Zeng et al, *Nature* 2004, **428**, 157. (3) K. Hayashida, et al. *PRL* 2007, **98**, 195502. (4) J. Zhang, F. Bates, *J. Am. Chem. Soc.* 2012, **134**, 7636. (5) C. Xiao et al *Nature* 2012, **487**, 349. (6) B. Chen et al *Science* 2005, **307**, 96. (7) X.B. Zeng et al *Science* 2011, **331**, 1302. X.B. Zeng and G. Ungar, *Phil. Mag.* 2006 86 1093.

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