Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Frank-Kasper and other superlattice formations in a series of AB_n type giant molecules precisely constructed by functionalized nanoparticles. STEPHEN CHENG, XUEYAN FENG, RUIMENG ZHANG, CHIH-HAO HSU, GENGXIN LIU, The University of Akron, TAO LI, Argon National Laboratory, DR. TAO LI COLLABORATION, CHENG RESEARCH GROUP TEAM — A novel set of precisely defined AB_n type giant molecules has been designed and synthesized. They are consisted of one functionalized hydrophilic polyhedral oligomeric silsesquioxane (DPOSS) (A) connected with different numbers of hydrophobic BPOSS cages (B, n =1-7). With variation of the number of coordinated hydrophobic POSS B, different superlattice structures could be formed at a sub-20-nm scale. For example, the superlattice structure of DPOSS-$BPOSS_1$ can form a normal lamellar structure while DPOSS-$BPOSS_2$ changes to a double-dyroids phase. With increasing the number of BPOSS, hexagonal close packed cylinder phase can be formed by DPOSS-$BPOSS_3$. For DPOSS-$BPOSS_4$, DPOSS-$BPOSS_5$ and DPOSS-$BPOSS_6$, all of these giant molecules show the Frank-Kasper A15 phase, while DPOSS-$BPOSS_7$ can assembly into a sigma phase. With deep understanding of this set of model AB_n type giant molecules with functional "nano-atoms", it is promising to construct new generations of giant molecules for further development of functional materials with desired structures and macroscopic properties.

Stephen Cheng
Univ of Akron

Date submitted: 17 Nov 2016 Electronic form version 1.4