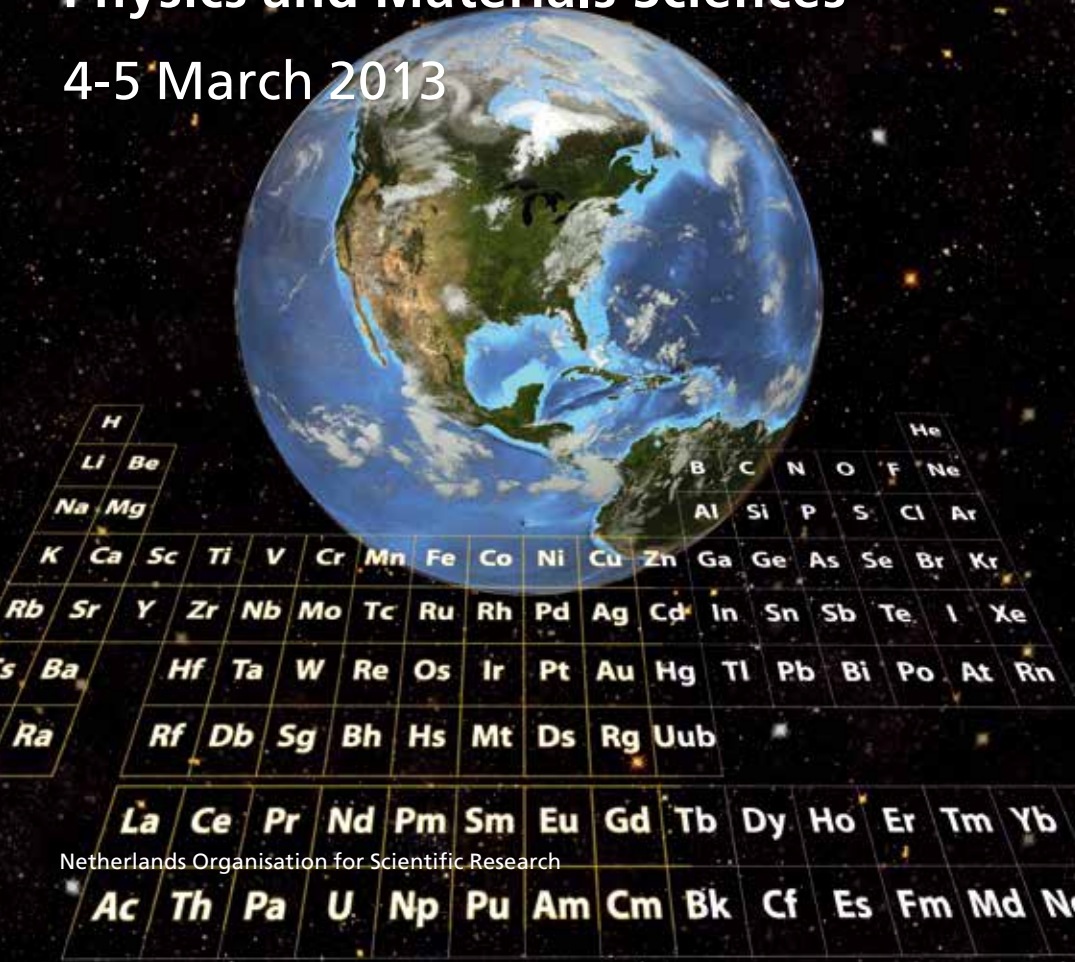
NWO CW Study group meeting

Chemistry in Relation to Physics and Materials Sciences

4-5 March 2013



Netherlands Organisation for Scientific Research

We consider asymmetric telechelic polymers with polypeptides as functional units and study formation of finite clusters using hybrid MD with a coarse-grained description of the TP. Sticker pair interactions are handled by interspersing molecular dynamics simulations with Monte Carlo moves to perform binding or unbinding of stickers. The morphology of the resulting finite clusters is characterized using graph topology and cluster analyses, as a function of polymer length, polymer density, number of binding sites, and strength of sticker attraction. Surprisingly the final topology of the clusters depends on the sequence of physicochemical triggers used for self-assembly of the TPs.

Session 11 – Perovskites

Control over the orientation of strontium ruthenate films on silicon substrates by seed layers of inorganic nanosheets

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Studies to the structure - property relationship of various materials play a central role in thin film research. With physical vapor deposition techniques, we are able to control crystal growth on an atomic level. In most cases, single crystal substrates with closely matching lattice parameters are required to obtain such a high degree of control.
As alternative to these costly substrates, we have been studying the use of inorganic nanosheets.

Nanosheets of Ti0.87O2 and Ca2Nb3O10 were synthesized and placed on silicon substrates by Langmuir-Blodgett deposition. Using pulsed laser deposition, SrRuO3 films were formed on the substrates containing the nanosheets seed layer. The presence of nanosheets had a clear impact on both the morphology of the films and the orientations of the crystallites. The nanosheets also had a clear effect on the magnetic properties of the films, which showed anisotropic behavior only when a nanosheet seed layer was used. A monolayer consisting of a mixture of both types of nanosheets was made to illustrate that nanosheets can be used to locally control the structure of films on a single substrate. This promising possibility may pave the way to films with position dependent properties that are determined by the local crystallographic orientation.