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Polymer Crystallization under Confinement

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Recent efforts indicated that polymer crystallization under confinement can be substantially different from the bulk. This can have important technological applications for the design of polymeric nanofibers with tunable mechanical strength, processability and optical clarity. However, the question of *how*, *why* and *when* polymers crystallize under confinement is not fully answered. Important studies of polymer crystallization confined to droplets and within the spherical nanodomains of block copolymers emphasized the interplay between heterogeneous and homogeneous nucleation. Herein we report on recent studies[1−5] of polymer crystallization under hard confinement provided by model self-ordered AAO nanopores. Important open questions here are on the type of nucleation (homogeneous vs. heterogeneous), the size of critical nucleus, the crystal orientation and the possibility to control the overall crystallinity. Providing answers to these questions is of technological relevance for the understanding of nanocomposites containing semicrystalline polymers. [1] H. Duran, M. Steinhart, H.-J. Butt, G. Floudas, *Nano Letters* **2011**, *11,1671.* [2] Y. Suzuki, H. Duran, M. Steinhart, H.-J. Butt, G. Floudas, *Soft Matter* **2013**, *9*, 2769. [3] Y. Suzuki, H. Duran, W. Akram, M. Steinhart, G. Floudas, H.-J. Butt, *Soft Matter*, **2013**, *9*, 9189. [4] Y. Suzuki, H. Duran, M. Steinhart, H.-J. Butt, G. Floudas, *Macromolecules* **2014***, 47,* 1793. [5] Y. Suzuki, H. Duran, M. Steinhart, M. Kappl, H.-J. Butt, G. Floudas*, Nano Letters* **2015**, *15*, 1987-1992. *In collaboration with Y. Suzuki, H. Duran, M. Steinhart, H.-J. Butt