Nanostructuring organic materials

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Resumen

Several approaches have been successfully used for structuring materials in the nanoscale range [1]. Among them, self-organizing strategies are an elegant solution for nanostructuring organic materials. Combining different molecules or introducing linkers, it is possible to tune the interactions and to achieve a more controlled self-organization process [2].

Here we present a summary of nanostructuring phenomena using organic materials by such strategies. With this aim, we have combined organic molecules of a perylene derivate PTCDA with iron atoms on a noble metal substrate Au(111). By fine-tuning the experimental conditions: temperature, rates and quantities of adsorbates; we obtained different metallorganic rearrangements. The achieved organic nanostructures are 0D (organic nanodots), 1D (molecular chains) and 2D extended structures.

The iron-PTCDA linkage cannot be described with covalent, nor ionic bonds, nor hydrogen bridges, but through coordination chemistry interactions [3]. The resulting metalorganic nanostructures, with different electronic properties than the original organic molecules [4], can be used for technological applications (photoluminescence devices), or as templates for other adsorbates [5].

Finally we introduce some results derived from lithographic experiments on the PTCDA+Fe/Au(111) system. By increasing the STM tip-sample field, we can promote the iron-PTCDA nucleation to form localized nanostructures, thus drawing different motifs on the gold substrate.

Referencias:

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[5] S. Stepanow, M. Lingenfelder, A. Dmitriev, H. Spillmann, E. Delvigne, N. Lin, X. Deng, C. Cai, J.V. Barth, and K. Kern, *Nature Materials* **3**, (2004) 229-233.

Figuras:

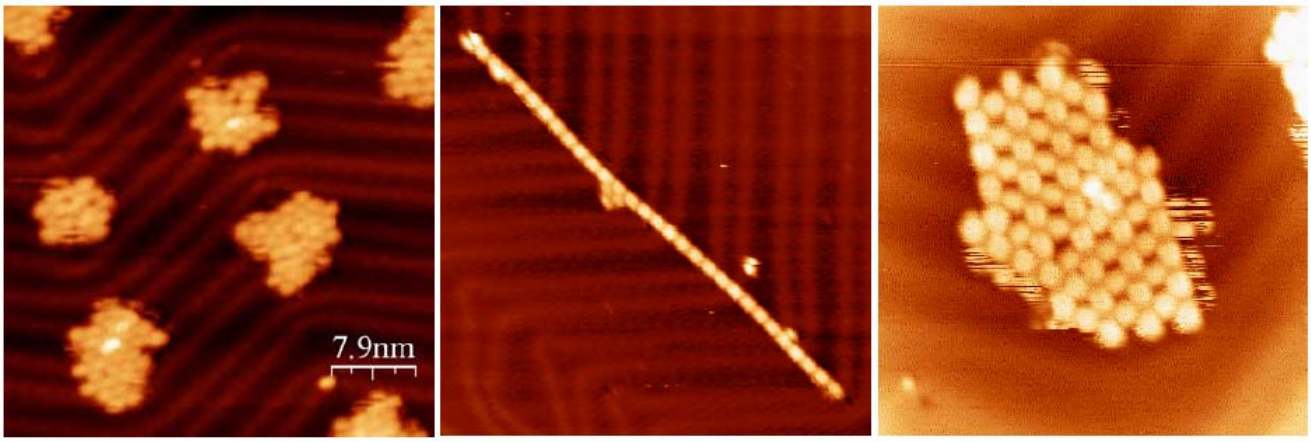

Figure 1. Metalorganic nanostructures: a) organic nanodots, b) molecular chains and c) 2D extended structures.

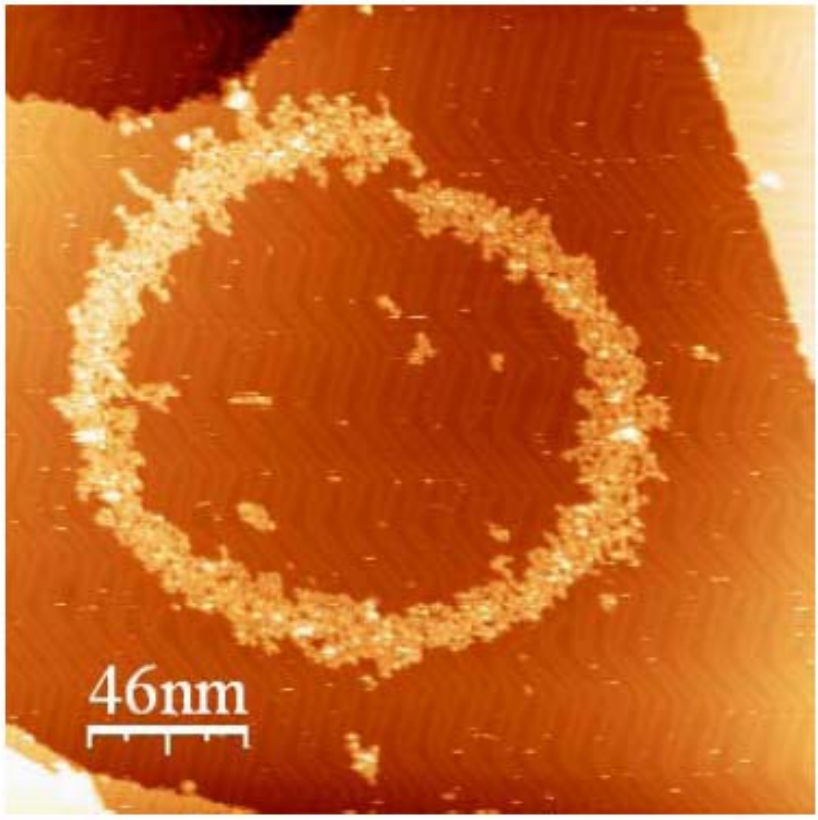

Figure 2. Metalorganic nanocorral obtained by surface diffusion and nucleation assisted with STM.