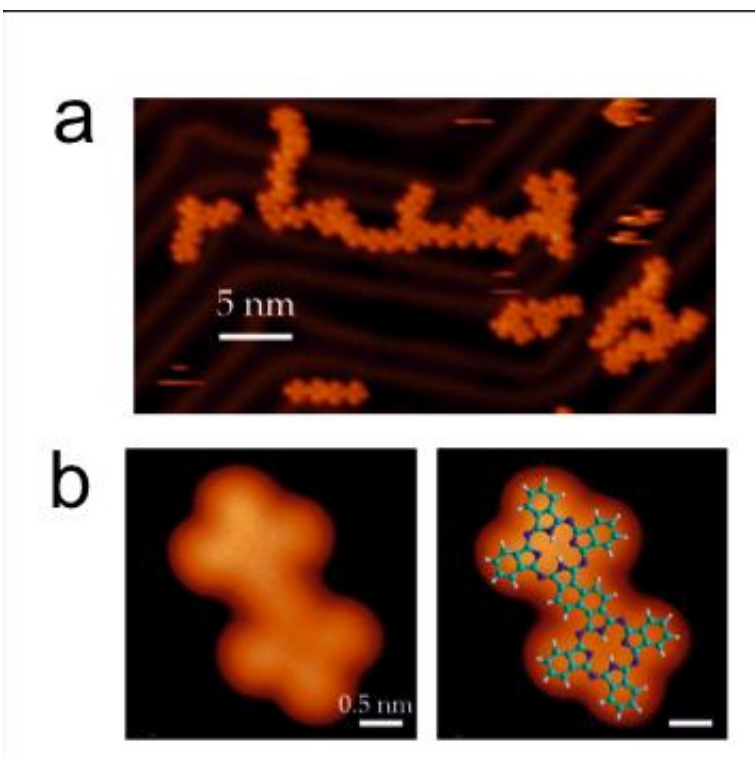


# New reaction for the synthesis of nanostructures

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a) STM image displaying the formation of quasi-unidimensional polymers.  
 b) STM image and models of the majority of products between coupled monomers. Credit: Dr. David Ecija, IMDEA Nanoscience

Scientists at the Institute of Chemical Research of Catalonia (ICIQ) have developed a new chemical reaction for the synthesis of low-dimensional polymers that can be rationalised as phthalocyanine derivatives. The results obtained have been published in *Nature Communications*.

Surface-mediated synthesis of low-dimensional polymers from simple molecular precursors is a rapidly emerging field. In this work, the researchers introduce surface-confined thermally tunable reaction pathways as a route to select intramolecular versus intermolecular reactions yielding either monomeric phthalocyanines or low-dimensional phthalocyanine polymers, respectively. The precursor was designed and synthesised at ICIQ's laboratories. It was then deposited on a gold surface and gently annealed to more than 300° C in order to study its behaviour.

When the temperature rises to 275° C, the polymerisation of the molecule occurs, resulting in phthalocyanine unidimensional polymers (phthalocyanine tapes) that had not been synthesised before. However, if the molecules are deposited on a substrate held at 300° C, the polymeric growth is blocked and the precursor is transformed into individual phthalocyanines. This selectivity induced by temperature, despite being a promising strategy for increasing the synthetic versatility, had not been used on surfaces up to now. Nevertheless, this technique could have huge advantages when engineering nanostructures with technological applications.

"On-surface [synthesis](#) is a promising strategy for the formation of nanostructures. This new thermally controlled [reaction](#) presents a very interesting alternative for the development of new polymeric materials that will satisfy the growing demand from disciplines such as nanotechnology, information technology and biotechnology," -say Prof. José R. Galan-Mascaros and Dr. David Ecija.

**More information:** Borja Cirera et al, Thermal selectivity of intermolecular versus intramolecular reactions on surfaces, *Nature Communications* (2016). [DOI: 10.1038/ncomms11002](https://doi.org/10.1038/ncomms11002)

Provided by Institute of Chemical Research of Catalonia (ICIQ)

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