Self-assembly of curcumin derivatives revealed by scanning tunneling microscopy at the solid/liquid interface

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Fabrication of ordered molecular patterns on surface in large area is becoming a major topic in supramolecular chemistry and nanoscience due to its promising application in optoelectronics, molecular devices and smart coatings[1]. Self-assembly is a bottom-up approach to fabricate ordered nanoarchitectures through supramolecular interactions such as hydrogen bonding, van der Waals force and metal-ligand coordination[2]. Scanning tunneling microscopy (STM) enables direct visualization of molecular arrangements on surfaces. In addition to nano-sized manufacturing, bio-based materials have attracted great attention for their eco-friendly properties and potential to replace the petroleum materials[3]. However, the reports on self-assembly behaviors of bio-based materials on surfaces are quite rare. Hence, we studied on the two-dimensional self-assembly of curcumin derivatives at the solid/liquid interface.

We prepared curcumin derivatives containing two or four alkyl chains with different chain length from C15 to C18. Depending on the number and length of alkyl chains, various two-dimensional structures based on odd-even effect were observed by STM at the highly oriented pyrolytic graphite (HOPG)/1,2,4-trichlorobenzene (TCB) interface, as shown in Figure 1. We believe that this work will contribute to the further understanding and fabrication of well-ordered molecular patterns with bio-based materials on surfaces.

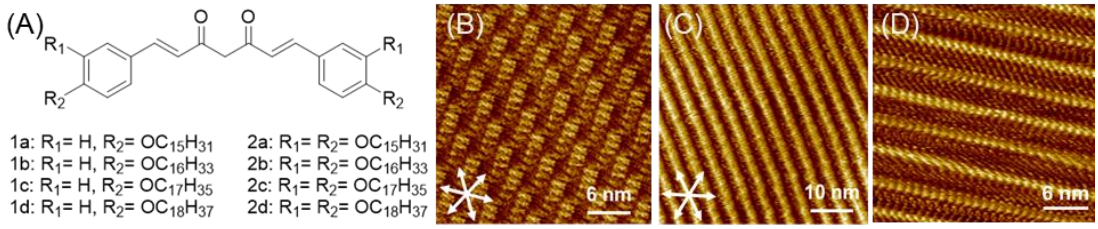

Figure 1 (A) Chemical structure of curcumin derivatives, and (B-D) STM images of compound 1a(B), 1b(C) and 2b(D).

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