Heat-/Electron-/Light-/Force-induced tautomerization in a single porphycene molecule

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Hydrogen transfer reactions are involved in many important physical, chemical, and biological processes. Intramolecular hydrogen transfer (tautomerization) is a fascinating model for studying the reaction dynamics and has recently gained increasing attention in the field of nanoscale science because the process resembles single-molecule switching [1,2]. We have studied tautomerization of porphycene—a structural isomer of free-base porphyrin and a good model of a double hydrogen transfer reaction [3]—by using low-temperature scanning probe microscopy (LT-SPM). Porphycene exhibits particularly interesting tautomerization behavior due to its strong intramolecular hydrogen bonds in the molecular cavity [4], and LT-SPM opens an unprecedented opportunity to investigate hydrogen transfer dynamics via the hydrogen bonds at the single-molecule level [5]. I will discuss direct observation and control of tautomerization in a single porphycene molecule on copper surfaces induced by different external stimuli—heat, tunneling electron [6–8], light [9], and force exerted by an SPM tip [10].

References

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