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标题: Driving and Controlling Molecular Surface Rotors with a Terahertz Electric Field
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来源出版物: ACS NANO 卷: 6 期: 6 页: 5242-5248 DOI: 10.1021/nn301001s 出版年: JUN 2012
在 Web of Science 中的被引频次: 0
被引频次合计: 0
引用的参考文献数: 33
摘要: Great progress has been made in the design and synthesis of molecular motors and rotors. Loosely inspired by biomolecular machines such as kinesin and the FoF1 ATPsynthase, these molecules are hoped to provide elements for construction of more elaborate structures that can carry out tasks at the nanoscale corresponding to the tasks accomplished by elementary machines in the macroscopic world. Most of the molecular motors synthesized to date suffer from the drawback that they operate relatively slowly (less than kHz). Here we show by molecular dynamics studies of a diethyl sulfide rotor on a gold(111) surface that a high-frequency oscillating electric field normal to the surface can drive directed rotation at GHz frequencies. The maximum directed rotation rate is 10(10) rotations per second, significantly faster than the rotation of previously reported directional molecular rotors. Understanding the fundamental basis of directed motion of surface rotors is essential for the further development of efficient externally driven artificial rotors. Our results represent a step toward the design of a surface-bound molecular rotary motor with a tunable rotation frequency and direction.
入藏号: WOS:000305661300075
语种 : English
文献类型: Article
作者关键词: surface rotor; Brownian machine; oscillating field; directed rotation; frequency control; directional switching
KeyWords Plus: SINGLE-MOLECULE; DYNAMICS SIMULATIONS; FORCE-FIELD; MACHINES; ROTATION; MOTORS; MECHANISM; AU(111); MOTION
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出版商: AMER CHEMICAL SOC
出版商地址: 1155 16TH ST, NW, WASHINGTON, DC 20036 USA
Web of Science 类别: Chemistry, Multidisciplinary; Chemistry, Physical; Nanoscience & Nanotechnology; Materials Science, Multidisciplinary
研究方向: Chemistry; Science & Technology - Other Topics; Materials Science
IDS 号: 963YQ
ISSN: 1936-0851
29 字符的来源出版物名称缩写: ACS NANO
ISO 来源出版物缩写: ACS Nano
来源出版物页码计数: 7