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Torsional Stick-Slip Behavior in WS_2 Nanotubes K.S. NAGAPRIYA, OHAD GOLDBART, IFAT KAPLAN-ASHIRI, Weizmann Institute of Science, Rehovot 76100, Israel, GOTTHARD SEIFERT, Technische Universität Dresden, D-01062 Dresden, Germany, RESHEF TENNE, ERNESTO JOSELEVICH, Weizmann Institute of Science, Rehovot 76100, Israel — We experimentally observed atomic-scale torsional stick-slip behavior in individual nanotubes of tungsten disulfide (WS_2). When an external torque is applied to a WS_2 nanotube, all its walls initially stick and twist together, until a critical torsion angle, at which the outer wall slips and twists around the inner walls, further undergoing a series of stick-slip torque oscillations. This is contrary to what happens in a multi-wall carbon nanotube, where an external torque causes the outer wall to slip and twist smoothly around the inner walls. We present a theoretical model based on DFTB calculations, which explains the torsional stick-slip behavior of WS_2 nanotubes in terms of a competition between the effects of the in-plane shear stiffness of the WS_2 walls and the inter-wall friction arising from the atomic corrugation of the interaction between adjacent WS_2 walls. K. S. Nagapriya, Ohad Goldbart, Ifat Kaplan-Ashiri, Gotthard Seifert, Reshef Tenne, and Ernesto Joselevich, Phys. Rev. Lett. **101**, 195501 (2008).

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