Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Simultaneous and coordinated rotational switching of all molecular rotors in a network YUAN ZHANG, Argonne National Lab., HEATH KERSELL, Ohio Univ., ROMAN STEFAK, JORGE ECHEVERRIA, CEMES, CNRS, Toulouse, VIOLETA IANCU, GAYANI PERERA, YANG LI, APARNA DESAHPANDE, KAI-FELIX BROWN, Ohio Univ., CHRISTIAN JOACHIM, GWENAEL RAPENNE, CEMES, CNRS, Toulouse, SAW-WAI HLA, Ohio Univ. / Argonne National Lab., ACROSS ATLANTIC COLLABORATION: MOLECULAR MACHINES IN ACTION COLLABORATION — A range of artificial molecular systems has been created that can exhibit controlled linear and rotational motion. To further develop such systems, a key step is adding communication between molecules in a network. Here, we show that a two-dimensional array of dipolar molecular rotors can undergo simultaneous rotational switching when applying an electric field from the tip of a scanning tunnelling microscope. Several hundred rotors made from porphyrin-based double-decker complexes can be simultaneously rotated in a hexagonal rotor network on a Cu(111) surface by applying biases above 1 V at 80 K. The phenomenon is observed only in a hexagonal rotor network due to the degenerated ground-state dipole rotational energy barrier of the system. Defects are essential to increase electric torque on the rotor network and to stabilize the switched rotor domains. At low biases and low initial rotator angles, slight reorientations of individual rotors occur, resulting in the rotator arms pointing in different directions. Analysis reveals that the rotator arm directions are coordinated to minimize energy via crosstalk through dipolar interactions. DE-FG02-02ER46012

Yuan Zhang
Argonne National Lab.

Date submitted: 11 Nov 2016 Electronic form version 1.4