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Colossal current driven conductance in artificial hybrid honeycomb system[1] PETER KAMPSCHROEDER, BROCK SUMMERS, ASHUTOSH DAHAL, JAGATH GUNASEKERA, DEEPAK SINGH, Univ of Missouri - Columbia — The artificial magnetic honeycomb lattice has emerged as a new research arena to explore novel magnetic and electronic properties of materials. Flexibility in tuning the lattice parameters, as well as the materials' characteristics in the newly designed lattice of ultra-small bonds allows us to explore practical applications that are illusive in conventional magnetic materials. For instance, the moderate current driven colossal electrical conductance/resistance is still a challenge to the scientific community. Here we present new results on the observation of current driven colossal conductivity in hybrid artificial honeycomb lattice. We nanofabricate the new system using a top down throughput approach, which results in macroscopic size sample with typical honeycomb bond dimension of 12 nm (length). 5 nm (width). Metallic layers of Sn (˜3.5 nm) and Nd (˜3 nm) are deposited in succession in ultra-high vacuum in order to create a clean lateral contact between the two metals. Detailed electronic and magnetic measurements at T = 30 K on the new system reveal colossal change in conductivity on a moderate application of current (˜5 micro-A) in zero magnetic field. The current driven colossal conductance persists all the way to T = 300 K, albeit weakly.

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