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Dislocation Dynamics in Multishell Carbon Nano-Onions[1] TRAIAN DUMITRICA, EVGENIYA AKATYEVA, University of Minnesota, JIANYU HUANG, Sandia National Laboratories — Graphite has long served as a model material to understand dislocations. An early work on natural graphite provided factual evidence for the existence of screw dislocations. Recently, synthetic carbon nanostructures began to be explored in order to understand dislocations at the nanoscale. Here we study the 1/2<0001> edge dislocation in nested multishell carbon onions [1]. We report in situ electron microscopy observations of dislocation dissociation and annihilation processes in individual nanometer-sized carbon onions. Essential for these processes is the counterintuitive motion of the 1/2<0001> edge from the outer surface to the inner region, which cross-links or unlinks a large number of shells. The correlation with atomistic simulations and analysis of the energy, which separates the strain and edge components, indicates that this inward glide originates in the reduction of edge with each inwards glide step, an effect specific to the spherical topology.

[1] E. Akatyeva, J. Y. Huang and T. Dumitrica, Phys. Rev. Lett. 105, 106102 (2010).

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