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Controlled healing of graphene nanopore KONSTANTIN ZAKHARCHENKO[1], Nordita, ALEXANDER BALATSKY, LANL — Graphene is often mentioned as a promising material for nanopores applications in DNA sequencing, sensory, biosensoring and molecular detectors. We will present realistic computer simulation studies of regrowth and healing of graphene nanopores of different sizes ranging from 30 to 5 Å. Our simulations clearly point to at least two distinct healing mechanisms of graphene sheet: one so called edge attachment mechanism, where carbons are attached to the edges of graphene sheet and second, the direct insertion mechanism, that involves atom insertion directly into a sheet of graphene even in the absence of the edges. Insertion mechanism is a suprising prediction that points to the growth process that would be operational even in the pristine graphene. We have uncovered an unusual dependence in the speed of nanopores regrowth and structure of "healed" areas as function of its size in the wide range of temperatures. Our findings point a significantly more complicated pathways for graphene annealing. They also provide an important enabling step in development of graphene based devices for numerous nanotechnology applications.

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