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Folded graphene nanochannels via pulsed patterning of graphene[1]

RODRIGO G. LACERDA, IVE SILVESTRE, Dept. Fsica, Universidade Federal de Minas Gerais, CP 702, Belo Horizonte, MG, Brazil, ARTHUR W. BARNARD, School of Applied Eng. Physics, Cornell University, Ithaca, NY 14853, USA , SAMANTHA P. ROBERTS, PAUL MCEUEN, Dept. of Physics, Cornell University, Ithaca, NY 14853, USA — We present a resist-free patterning technique to form electrically contacted graphene nanochannels via localized burning by a pulsed white light source. The technique uses end-point detection to stop the burning process at a fixed resistance. By this method folded graphene nanochannels down to 30 nm in width with controllable resistance ranging from 10 kΩ to 100 kΩ is achieved [1]. Folding of the graphene sheet takes place during patterning, which provides very straight edges (zigzag/armchair) as identified by AFM, SEM and TEM. Electrical transport measurements for the nanochannels show a non-linear behavior of the current vs source-drain voltage as the resistance goes above 20 kΩ indicating conduction tunneling effects. The method described can be interesting not only for fundamental studies correlating edge folded structures with electrical transport but also as a promising path for fabricating graphene devices in situ. This method might also be extended to create nanochannels in other 2D materials. [1] I. Silvestre et al., APL, 106, 153105, 2015.

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