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Interacting wrinkles in graphene on patterned substrates[1] ZOE BUDRIKIS, ISI Foundation, Turin, Italy, ALESSANDRO L. SELLERIO, CNR-IENI, Milan, Italy, ZSOLT BERTALAN, ISI Foundation, Turin, Italy, STEFANO ZAPPERI, CNR-IENI, Milan, Italy — The wrinkling of graphene on patterned substrates is interesting both because graphene is an exemplary thin sheet with effective mechanical thickness less than 1 angstrom, and because of the importance of strain for graphene's electronic properties. We present a combination of atomistic and large-scale coarse-grained numerical simulations of graphene on top of a substrate of size $\sim 1\mu\text{m}^2$ decorated with nanoparticles of diameter ~ 10nm. We are able to reproduce previous experimental results in which substrate protrusions are connected by a network of long narrow wrinkles [1], and we clarify the role of substrate-graphene interactions in determining the morphology of these. Our simulations also allow us to explore in further detail a previously-overlooked feature, namely the possibility for interacting wrinkles to form stable "avoiding" configurations, in a manner reminiscent of interacting cracks [2]. By nucleating and growing wrinkles in a controlled way, we are able to characterize the role of long-range stress fields in determining whether two wrinkles will avoid or merge.

[1] M. Yamamoto et al, Phys. Rev. X 2, 041018 (2012).
[2] M. L. Fender, F. Lechenault, and K. E. Daniels, Phys. Rev. Lett. 105, 125505 (2010).

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