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Short Communication

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Dewetting assisted self-assembly/ origami formation and folding of graphene particles

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Abstract:

All the unique properties of graphene, which make it, such an invincible material stems from its unique structure, which because of its flexibility can be morphed into different origami forms by application of external forces. The properties of controllable folding and unfolding of graphene can be useful in creating actuators. Whereas 3D stacking can improve the optical, electrical properties many fold and all this can be achieved by virtue of stress engineering of the underlying supporting material. In our present work we try to achieve this with the help of a simple dewetting force. Upto now nanoparticle laden polymeric films are only found to arrest dewetting. However, if such a film be cast where the concentration of the graphene particles vary throughout the lateral length, the dewetting started from the lean particle-concentraton zones is seen to force the graphene particles on the extreme other zone to self-assemble. Moreover, the concentration difference of the particles also lead to Marangoni forces which lead to nano-particle walk-offs and tearing of the underlying film and folding of the graphene particles into graphene nano-ribbons. The work sheds light on the forces responsible for the evolution of different origami structures formed as a result of the underlying stress engineering without the aid of any high-end instrumentation or process. Since these self-assembled structures are formed over a bio-compatible polymer, the structures are anticipated will be instrumental in fabricating biosensor, super-capacitors, biomedical microfluidic devices and for other in vitro and in vivo applications.

Biography:

Dr. Jayati Sarkar acquired her Bachelor of Chemical Engineering degree from Jadavpur University, Kolkata in the year 2000, M.Tech in Chemical Engineering from IIT Kanpur in the year 2001 and PhD in Chemical Engineering from IIT Kanpur in the year 2005. In PhD her research work was in the field of instabilities in thin soft elastic films and the phenomena that occur there namely adhesion, debonding, dewetting and pattern formation.