We have developed a mechanical shrinkage-based nano-architecturing technique (which we termed shrink-nanomanufacturing) for atomically-thin materials (*Nano Letters* **15**, 7684 (2015); *Nano Letters* **15**, 1829 (2015); *Nano Letters* **14**, 3304 (2014)). We shrink-manufactured corrugated graphene and MoS2 monolayer structures via thermally-induced contractile deformation of shape memory polymer substrates. The resultant compressive strain leads to well-defined corrugation of a graphene or MoS2 monolayer without the need for any prior patterning step that is typically required for other methods like photo- or nano-imprint-lithography.

We have further developed a robust method to integrate graphene with controlled nanoscale corrugations onto various three-dimensional (3D) microstructure templates (*Nano Letters* **15**, 4525 (2015)). We combined substrate swelling, shrinking and adaptation processes and integrated graphene via delamination-buckling. The amount of substrate swelling is controlled to modulate nanoscale corrugations of graphene. These techniques showcase our ability to use mechanical instability to create micro/nano-scale structures of 2D materials and to precisely control shapes and local strains.