

Studies on the development of devices using MXenes/mono-elemental 2D materials for energy harvesting and storage applications – BRNS

Theme: MXene based devices for energy storage applications.

Objective: Development of high performance supercapacitive devices through structural and electronic modification of MXene based porous structures.

Deliverables: MXene based supercapacitive devices simultaneously possessing high energy and power density metrics.

- ❖ A highly scalable, facile self-assembling technique has been developed to realize MXene based porous hydrogel structures with controlled ion-diffusion channels.
- ❖ MXene based asymmetric supercapacitor device, capable of delivering high energy and power density of 30 Wh/Kg and 1130 W/Kg respectively have been successfully fabricated.



MXene based hydrogels in fabricated in different shapes

MXene Supercapacitor device fabricated in commercial cell

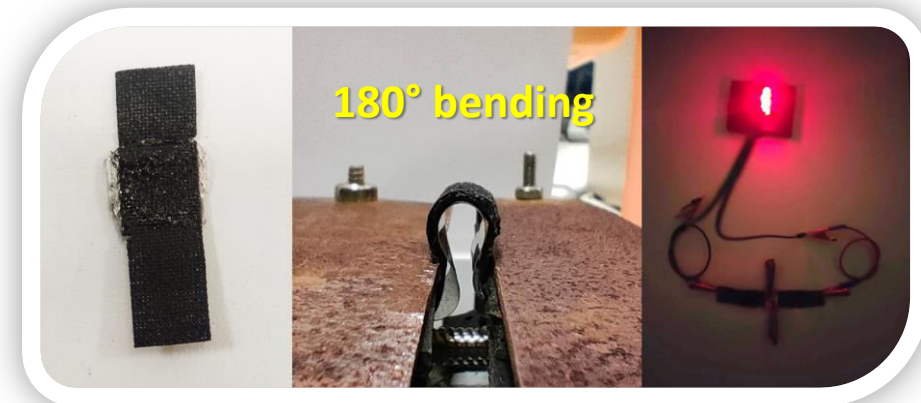
Ultrafast Joule heating induced defect healing and in-situ activation of spontaneously assembled graphene network for wearable energy storage – DRDO

Theme: Graphene based wearable energy-storage devices

Objective: Development of high areal energy and power density wearable energy storage system by overcoming the existing bottlenecks in this field via ultrafast Joule heating.

Deliverables: Wearable supercapacitor devices with activated graphene and graphene-hybrids integrated in fabric.

- ❖ High performance wearable devices with reduced graphene, activated via ultrafast Joule heating have been developed.
- ❖ The fabricated wearable devices are stable under extreme bending conditions with negligible drop in performance under 5000 bending test.



Solid-state wearable device in normal and 180° bend state

Two wearable device powering 5 LED's.