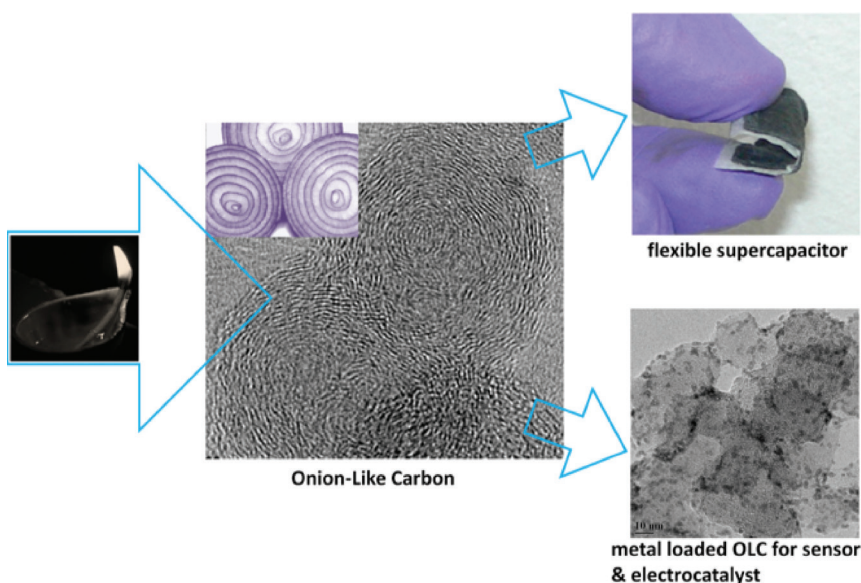


## Ancient art to advanced nanomaterial – onion-like carbons



Carbon is increasingly realised as the core material for many advanced technological application. It appear in various forms in the nature such as activated carbon, carbon black, carbides derived carbon, carbon nanotubes and graphene. Each of these forms of carbon has been tested for various technological applications such as energy storage and conversion, medical applications, electronics and strong structural materials like composites. Though there are encouraging lab-scale reports on the excellent properties, the main bottleneck is how to prepare quality carbon material in an economical way, with less processing steps and preserving the core properties of any form of carbon. Though graphene has shown tremendous potential in lab-scale, the main challenge is the cost of production. With these challenges, our research group has demonstrated the preparation of a different form of the carbon: Onion like carbon (OLC).

OLC is a form of carbon with concentric graphene rings, mimicking the morphology of an onion.

Modifying the ancient traditional procedure to prepare 'Kajal', they have derived OLC in its purest form. The procedure is scalable and can produce OLC with an average particle size of 30 nm. With large specific surface area OLC can be used for energy storage, sensors, corrosion protection and environmental remediation. We have demonstrated a flexible super capacitor using OLC, which can cost less than a dollar. Such cost reduction was possible because of the economical synthesis technique and a novel electrode design using fabric. In another demonstration of the potential of the OLC, we have also prepared a hybrid material with ultrafine (2-3 nm) palladium nanoparticle distributed on OLC. We have demonstrated the excellent sensing activity of the hybrid material. These OLC-based hybrid material exhibits superior sensing response current as compared to Vulcan® and MWCNT- based nano catalysts. Our group is actively exploring other functional applications of OLC, from smart anti-corrosion coatings, optical properties to medical applications.