Synthesis of Graphene/ Bacterial Cellulose/Polyaniline Nanocomposite for Gas Detection

Nanomaterial have become more relevant because of their widespread and common applications in the several areas including industrial production, environmental studies, medical applications, etc.. Among these nanomaterial, graphene has attracted particular interest due to its exceptional chemical and excellent electronic properties, optimal mechanical stiffness, and electrical conductivity, which are desirable properties in fabrication of gas sensors. Bacterial cellulose (BC) has many structural aspects favourable for several applications, among which high surface area, a large number of mesopores and macropores and nanoscale fibers in three dimensional (3D) structure. These advantages have led to successful covalent intercalation of amino-functionalized graphene (AG) with BC fibres *via* a one-step esterification.

Conducting polymers including polyaniline (PANI) is easily synthesized and its molecular chain structure can be modified conveniently by copolymerization or structural derivations. Its unique electrical, electrochemical, and optical properties can also be utilized as efficient sensors for monitoring organic and inorganic compounds. Therefore, it is expected that the AG/BC/PANI nanocomposite can enhance the sensitivity and selectivity of sensors, through the combination of these excellent sensing materials.

In this study, we designed and synthesized a AG/BC/PANI flexible nanocomposite gas sensor. The crosslinking was carried out by using a one-step esterification process to construct cross-linked BC/AG (CLBC/AG) and followed by the growth of PANI chains on the CLBC/AG substrate. The morphology of the samples were characterized by scanning electron microscopy (SEM) and the electrical conductivity variation of the AG/BC/PANI with different reaction times at room temperature was investigated.