Carbon-doped Graphitic Carbon Nitride Based Films as New Functional Materials

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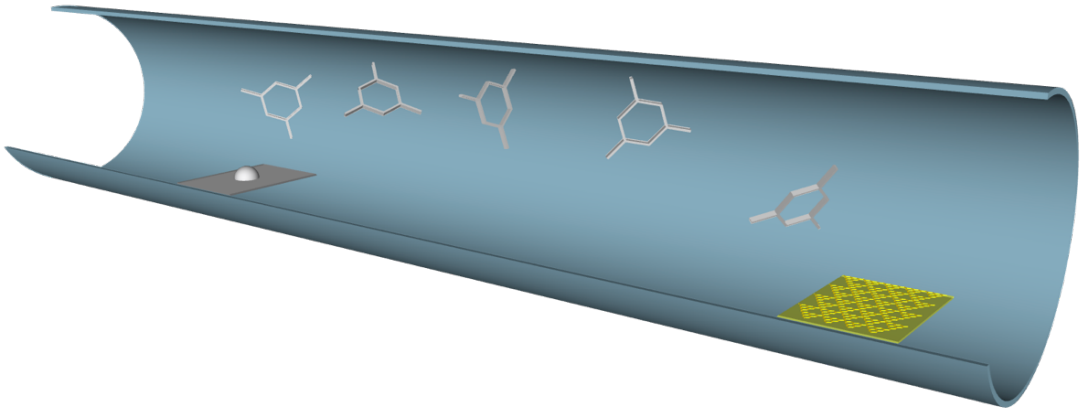
Graphitic carbon nitride (GCN) has been of interest because it offers high performance as a photocatalyst, the absence of rare metals, non-toxicity and biocompatibility. However, GCN has traditionally been a powdery material that is difficult to process, making it unsuitable for a variety of applications. Recently, some works have developed methods to form GCN film, and properties as sensors, actuators, and optical materials have been reported.[1,2] However, the energy band gap of pure GCN film is ca. 2.7 eV, which is too large to be used as a semiconductor, and its optical and electrical properties have not reached the required level. The disadvantage of this large energy band gap is confirmed by the fact that the photocatalytic activity of GCN can only be performed in ultraviolet light. In order to explore the potential of GCN films for electronic and optical devices, it is essential to develop methods to narrow the band gap.

Here, we propose a way for narrowing the band gap of GCN films by carbon doping. We obtained homogeneous carbon-doped GCN films by chemical vapor deposition [2,3]. While maintaining the molecular and layered structure of carbon-doped GCN, the maximum carbon/nitride ratio of the carbon-doped GCN film reached 1.016, which was 26.6% higher than that of the pure GCN film, allowing the film to achieve more redshift, lower band gap, and higher electrical conductivity.



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