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Photocatalytic activity of the N-rich graphitic carbon nitride

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Graphitic carbon nitride (g-C3N4) is a novel metal-free polymer semiconductor that has received a great deal of interest for a wide range of applications due to its ease of synthesis, modification, environmental friendliness, suitable bandgap, higher light harvesting, unique electronic properties, and physicochemical properties. Because of these properties, g-C3N4 has been considered as a promising photocatalyst for organic pollutant degradation and water splitting. Nitrogen- rich graphitic carbon nitride (Ng-C3N4) with improved photocatalytic activity was engineered using a facile post-annealing treatment of pristine g-C3N4 in N2 atmosphere. The thermal annealing did not modify the crystal structure, vibrational modes, or morphology of the N-rich g-C3N4 (Ng-C3N4). However, it decreased the crystallinity by broadening the dominant X-ray diffraction (XRD) peak and increased the surface area and mesoporous nature because of the formation of carbon vacancies. Diffuse reflectance spectroscopy indicated that the bandgap of the annealed g-C3N4 decreased from 2.82 to 2.77 eV compared to pristine g-C3N4. The increase of nitrogen content in the annealed Ng-C3N4 was quantified by X-ray photoelectron spectroscopy (XPS), which was also used to examine the formation of carbon vacancies. Photocurrent and electrochemical impedance spectroscopy measurements showed that the annealed N g-C3N4 had higher light absorption capacity than the pristine g-C3N4. The photocatalytic performance of the samples was investigated for the degradation of crystal violet (CV) under ultra-violet light irradiation. The annealed Ng-C3N4 sample exhibited superior photodegradation of CV over pristine g-C3N4.

Recent Publications

1. Nagajyothi P C (2018) One-step engineered self-assembly Co3O4 nanoparticles to nanocubes for supercapacitors. Materials Research Express 5:02551.
2. Sreekanth T V M, Jyothi P C N, Dillip G R and Lee Y R (2017) Determination of band alignment in the synergistic catalysis of electronic structure modified graphitic carbon nitride integrated ceria quantum dot heterojunctions for rapid degradation of organic. The Journal of Physical Chemistry C 21:25229.
3. Dillip G R (2017) Tailoring the bandgap of N-rich graphitic carbon nitride for enhanced photocatalytic activity. Ceramics International 43:6437.
4. Sreekanth T V M (2017) Degradation of organic pollutants by bio-inspired rectangular and hexagonal titanium dioxide nanostructures. Journal of Photochemistry and Photobiology B: Biology 169:90.
5. Nagajyothi P C (2017) Green synthesis: In-vitro anticancer activity of copper oxide nanoparticles against human cervical carcinoma cells. Arabian Journal of Chemistry 10:215

Biography

T V M Sreekanth received his PhD in Chemistry from SV University, India, in 2009, under the supervision of Professor K S Reddy. Later, he joined as an Assistant Professor in the Department of Chemistry Dongguk University, Gyeongju, South Korea. He then moved to the College of Mechanical Engineering, Yeungnam University, South Korea. His research interests include the synthesis of metal and metal oxide nanoparticles and their photocatalytic applications. His recent research activities focus on electrochemical energy storage.

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