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Title:	Wavelength dependent luminescence decay kinetics in 'quantum-confined' g-C <sub>3</sub> N <sub>4</sub> nanosheets exhibiting high photocatalytic efficiency upon plasmonic coupling
Authors:	Mondal, Sanjit (/jspui/browse?type=author&value=Mondal%2C+Sanjit) Sahoo, Lipipuspa (/jspui/browse?type=author&value=Sahoo%2C+Lipipuspa) Vaishnav, Y. (/jspui/browse?type=author&value=Vaishnav%2C+Y.) Mishra, Samita (/jspui/browse?type=author&value=Mishra%2C+Samita) Roy, R.S. (/jspui/browse?type=author&value=Roy%2C+R.S.) De, A.K. (/jspui/browse?type=author&value=De%2C+A.K.) Gautam, U.K. (/jspui/browse?type=author&value=Gautam%2C+U.K.)
Keywords:	photoluminescence luminescence decay quantum-confined' g-C <sub>3</sub> N <sub>4</sub>
Issue Date:	2020
Publisher:	Royal Society of Chemistry.
Citation:	Journal of Materials Chemistry A, 8(39) pp. 20581-20592.
Abstract:	Serendipitous observations offer newer insights into materials properties. Here we describe g-C <sub>3</sub> N <sub>4</sub> nanosheets exhibiting remarkably blue-shifted photoluminescence within the 390-580 nm range centred at 425 nm which matches more closely with its 'quantum-dots', and yet is excitation-wavelength independent. Moreover, surprisingly, the luminescence decay becomes increasingly slow at higher emission wavelengths, by up to 10 times. The nanosheets absorb only a fraction of visible-light. To improve this, when we designed a nanocomposite of g-C <sub>3</sub> N <sub>4</sub> and Au nanoparticles (NPs), it retained the PL characteristics and also exhibited excellent light-harvesting and photocatalytic efficiency for benzylamine (BA) oxidation. The surface plasmon resonance of the Au NPs is responsible for the high visible-light response and assisting the reaction by the 'hot-electron' injection mechanism, while an uncharacteristic, pronounced co-catalytic effect by them further improves the efficiency. The conversion is 98% with >99% selectivity over 1.5 h of natural sunlight and open-air, probably the highest efficiency for BA photo-oxidation reactions. Even though such a dual role by plasmonic NPs has remained unscrutinized, we argue that the charge-transfer processes for the 'hot-carrier' injection and co-catalytic events are well-separated in time due to a much slower photon incident frequency on a catalyst particle, enabling both to occur simultaneously in the same particle
Description:	Only IISERM authors are available in the record.
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