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G-C3N4 BASED PHOTO-CATALYSIS FOR SUSTAINABLE FUTURE ENERGY CONSERVATION IN CHEMICAL TRANSFORMATIONS UNDER VISIBLE LIGHT

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Solar energy has been proposed as the most attractive alternative energy source for the development of clean and renewable energy. Heterogeneous photo catalysis offers the capability to directly harvest, convert, and store solar energy in the form of sustainable organic fuels and platform chemicals. In such context, semiconductor photo catalysis has recently emerged as a promising technology for the generation of clean energy and for the application of solar energy in catalysis. Recently g-C_3N_4 is a polymer n-type semiconductor possessing unique electronic, optical, and physiochemical properties, which underpin its use in electronics, catalysis, and energy production/storage. Carbon nitride has attracted the attention of researchers because of its unique and interesting physicochemical properties viz., efficiency of operation under visible light, semiconductor properties (band gap of ~2.7 eV), high stability, nontoxicity, metal free organo catalyst, environmentally benign photo catalysts and simple fabrication from cheap raw materials without any additive. Recently, Prof Yoel Sasson; our research group demonstrated g-C_3N_4 based photo catalysis with enormous possibilities. Few of them are; we describe for the first time a pressure free, mild photochemical protocol for selective reduction of olefin and nitro compounds using a non-hazardous, abundant, and eco-friendly H_2O–Mg pair as a H_2 donor in the presence of a Pd-g-C_3N_4 photo catalyst at RT. The new reaction system is a more expedient and greener protocol compared to earlier studies. In another approach, a novel heterogeneous photoactive catalyst is developed by incorporating ruthenium over a new photoactive g-C_3N_4 support for efficient photocatalytic transfer hydrogenation with significant features of the photoactive catalyst Ru-g-C_3N_4 are viz., it is easy to handle in visible light (LED lamp), does not require an external base, solvent free, non-toxic, environmentally friendly and proceeds under very mild reaction conditions. In my present postdoc (RCPTM), we are exploring the single atom based g-C_3N_4 heterogeneous catalysis.

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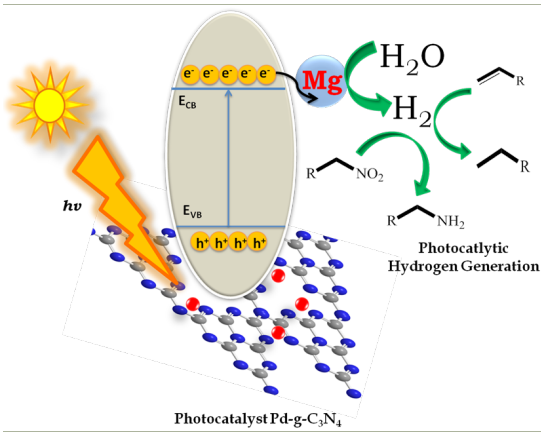

Figure 1: Pd-g-C3N4 photo catalyst for Hydrogen generation