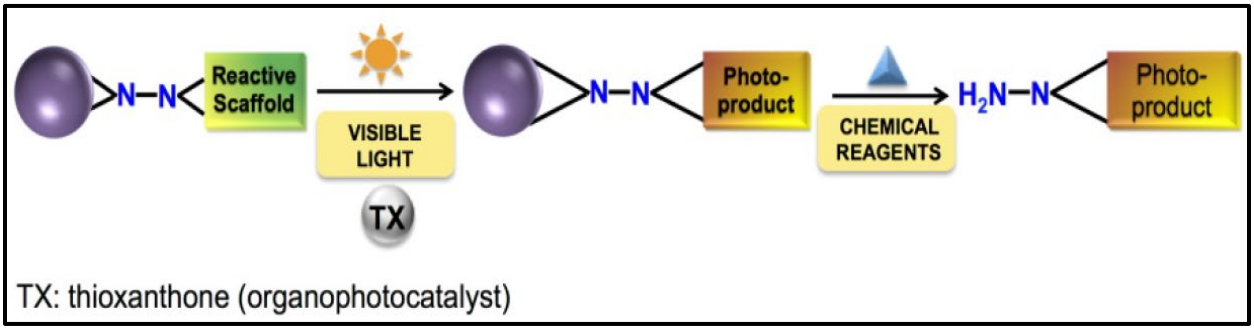
METAL-FREE SYNTHESIS OF N-CONTAINING COMPOUNDS USING STABILIZED PHOTOREACTIVE HYDRAZIDE SCAFFOLDS (RFT-514)

Invention Summary:

NDSU Scientists have developed highly stable hydrazide-based scaffolds that use visible light and a metal-free process to produce molecules and polymers that contain nitrogen (positioned singly or as a pair of adjacent nitrogen atoms). This scaffold begins with a N-N bond that can be used as a catalyst to make anything from drug and specialty molecules to complex polymers. The N-N moiety allows creation of unique N-containing molecules, using visible light rather than higher energy UV. The unique approach is possible because the NDSU team as developed handling procedures that stabilize the hydrazide scaffold until a light sensitizer (such as thioxanthone) is added. The scaffold utilizes photoinduced excited state chemistry rather than ground state redox chemistry, providing substantially different end products and performance attributes as compared with compounds derived from redox chemistry.

Using these novel compounds that feature N-N single bonds, one can perform visible light mediated reaction to access and build upon a complex structural scaffold. Once employed for visible light reaction the N-N bond can be cleaved either between the nitrogen atoms or to leave behind two adjacent nitrogens. The N-N based compounds can also be separated as enantiomers and can be utilized as stationary phases for separation of chiral compounds. Last but not the least, N-N based compounds can be fine-tuned as co-catalyst for photo-polymerization reaction.



TX: thioxanthone (organophotocatalyst)

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Benefits:

- The scaffold's N-N bond can also be made an atropisomer due to restricted bond rotation - These atropisomers can be separated, are thermally stable, and can be employed in light-induced reactions with >95% selectivity
- Either a single nitrogen or a N-N moiety can be retained upon removal of the scaffold, providing opportunities to generate a wide variety of unique compounds whose performance differs from compounds that are currently available
- Less expensive production, because fewer steps are required, and metal is not – this translates to less purification, fewer reagents, and less energy consumed
- Lower energy visible light (as compared with commonly used UV) initiates the reactions in an easy, efficient, and cost-effective process
- Desired end products can be obtained and optimized by using specific wavelengths

Phase of Development:

This technology has successfully completed laboratory testing with reproducible results.

Patents:

This technology is the subject of Issued US patent no. 10,919,866 and is available for licensing/partnering opportunities.

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