

Polyimine-based Triplet Photosensitisers: using light to exploit important biological and organic applications.

A PhD studentship is available within Prof. Sylvia Draper's group in the School of Chemistry and in the Centre for Research on Adaptive Nanostructures and Nanodevices at Trinity College Dublin (TCD). The project will be undertaken in the Draper research team within the Advanced Functional Materials research theme of AMBER. The position is funded by Science Foundation Ireland under the AMBER 2 centre award.

Project Overview:

Triplet excited states in inorganic transition metal complexes have many potential uses. They have found application in photodynamic therapy (PDT) and as photocatalysts. Their unique photophysical properties offer an opportunity to enhance the likelihood of electron or energy transfer. In the Draper team we have been developing novel molecular designs to create complexes that show strong absorption in the visible or NIR regions. We have found that coordination complexes of Ru(II) and Ir(III) with ethynyl appended chromophores such as coumarin, or BODIPY have particularly desirable absorption and emission properties including intersystem crossing efficiencies of near unity. Our aim is to develop materials that can be excited at low energy wavelengths, transparent to skin, and efficiently generate singlet oxygen (to kill cancer cells), or higher energy photons to initiate a chemical reaction such as a polymerization process.

To achieve these goals, we work with collaborators from all over the world. We constantly fine-tune our synthetic designs to enhance the properties of the materials and to understand and investigate their electron and photon transfer processes more thoroughly. We are pushing the boundaries of what our materials can achieve, exploring novel phenomena such as so-called "dark" triplet states, which we have established can generate singlet oxygen, and two-photon absorption behaviour, which offer opportunities to use low energy light and initiate processes such as upconversion and photopolymerization reactions (applicable to 3D printing techniques).

The research is all the more exciting because it uses a combination of ligand synthesis, inorganic chemistry and spectroscopy. It has gathered momentum and recognition over a sustained period e.g. 2017 RIA Chemistry PhD of the year award, ICI David Browne award 2019 and European Academy of Science fellowship in 2021.

The PhD student will work closely with other members of a multidisciplinary environment including PIs, postdoctoral and postgraduate researchers within the School of Chemistry and AMBER and our collaborative teams in Dalian University of Technology (China), St. Andrew's University and the Universities of Munster and Barcelona.

Eligibility

Applications are invited from excellent candidates with a Bachelor/Master Degree in Chemistry, Medicinal or Materials Chemistry, (or related disciplines). Experience in organic synthesis and spectroscopy would be desirable. Regrettably due to the nature of the funding, the position is only open to EU applicants.

How to apply:

CV with the names and emails of three referees should be e-mailed to: Prof. Sylvia Draper (deanSTEM@tcd.ie). The position will remain opened until filled, but the preferred start date is September 2021.

The School of Chemistry holds an Athena SWAN bronze award and provides equal opportunities for individuals regardless of their gender identity or expression, race, culture or background.