



TITLE: Photon Upconversion Redox Catalysis

ABSTRACT: Photon upconversion (UC) based on triplet-triplet annihilation (TTA) is one of the most attractive wavelength conversion technologies. Its interest has been intensified in the last decade due to the employment of low intensity and non-coherent light. This synchronized biphotonic process transforms visible to UV light which includes a bimolecular system and the association of multistep photochemical events. Recently, we have demonstrated the application of photon upconversion (UC) technology based on triplet-triplet annihilation (TTA) to catalytic reactions such as dehalogenation or C-C coupling reactions. Here, I wish to show that this synchronized biphotonic process (TTA-UC) is a potential synthetic tool for other chemical transformations to obtain products with added value. Visible light, ambient temperature and pressure, low-loading metal-free photocatalysts and no additives make this protocol very attractive. In addition, and regarding two-photon energized forms, photogeneration of radical anions of aryl halides (Br) can be achieved by means of consecutive PET processes involving a doublet excited state. Thus, these approaches have been used to turn photoredox catalysts into “super reductants” with visible light.

BIO: Raúl Pérez Ruiz (born 1976, Valencia) obtained his B. Sc. in Chemistry at the University of Valencia (2001). In 2006, he received his PhD in Chemistry (European Doctorate) with honors under the guidance of Prof. Miguel Angel Miranda at the Polytechnic University of Valencia (UPV), supported by a FPI fellowship from the Spanish Government. During his PhD studies, he performed two short-term stays at the University of Cologne, Germany (Prof. Axel G. Griesbeck) and at the University of Amsterdam, The Netherlands (Prof. Luisa de Cola). During his post-doc period, he was awarded with the prestigious Alexander von Humboldt Fellowship, Fundación CajaMurcia postdoctoral fellow, Juan de la Cierva contract and Marie Curie-IEF Fellowship. Subsequently, he was awarded as senior assistant researcher by «Atracción de Talento Program 2016, Modalidad 1» funded by Community of Madrid and later he was Distinguished Researcher at the Chemistry Department in the UPV granted by the GenT programme from the Valencian Government. Since July 2022, Dr. Pérez Ruiz is Associate Professor in the DQ of the UPV. Related to bureaucratic aspects, Raúl Pérez Ruiz is currently Vice President of the Photochemical Group (GRUFO) of the Royal Spanish Society of Chemistry (RSEQ).



The scientific career of Dr. Pérez Ruiz has focused on the study of photochemical processes and molecular spectroscopy for their application in the areas of Organic Chemistry and Biology. Given his outstanding experience, he has opened new lines of research in DQ related to PHOTOREDOX CATALYSIS and VALORIZATION OF CARBON DIOXIDE (some of the hottest topics in Chemistry today), mainly related to the development of new transformations using light visible as energy source.

He is co-author of more than 60 scientific publications and 4 book chapters. He has given 20 invited and oral communications and has also participated in another >50 communications at national/international conferences. He has participated in 19 research projects, being principal investigator in 7 of them with funding of more than 1 million euros. He possesses 3 recognized research sections (“SEXENIOS”, 2003-2020). He is co-director of 5 Doctoral Theses (3 in progress), 3 Master Theses and 4 Final Degree Projects.