

## **Dynamics of protons transport and exciton transfer through time-resolved spectroscopy**

The Proton transport process plays a crucial role in  $\text{H}_2/\text{O}_2$  fuel cells. Protic ionic liquids (PILs) are promising candidates as non-aqueous electrolytes because of their low volatility, high electrochemical stability, and ionic conductivity. However, a mechanistic understanding of the long-range transport of excess protons in a PIL relevant to an operating fuel cell remains elusive in the literature. Here, we have utilized ultrafast pump-probe vibrational spectroscopy to follow the journey of excess protons in a PIL ethylammonium formate (EAF) and to decipher the proton transfer and long-range transport mechanisms.

In conventional solar cells, photons having energy higher than the band gap of the semiconductor (such as Si) create charge carriers with excess energy. This excess energy is lost as heat as the charge carriers rapidly thermalize to their respective band-edges. On the other hand, lower energy photons are not absorbed by the material. This can be achieved through carrier multiplication processes such as singlet fission (SF), in which a higher energy singlet excited state of certain organic chromophores splits into two equal energy triplet states. Thus SF, in combination with Si, can boost the efficiency of solar cells. The challenge is to harvest these triplets into Si, which is the second topic of this presentation.