Imaging Electron Tracks with Switchable Organic Fluors

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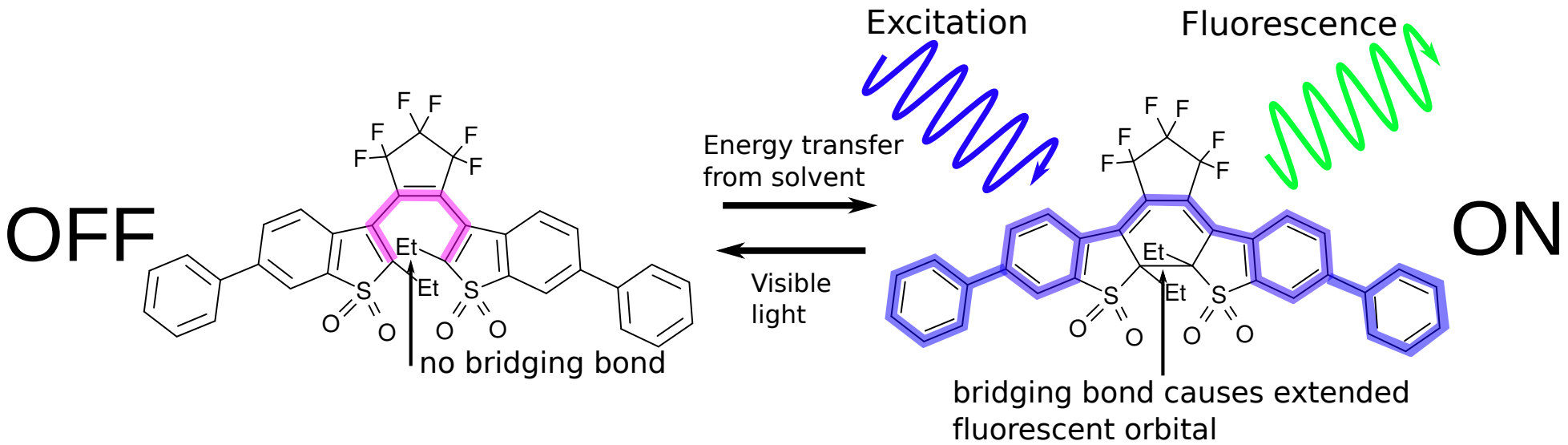


Highly transparent to visible light
Can absorb a UV photon and turn ON by changing shape and electronic structure

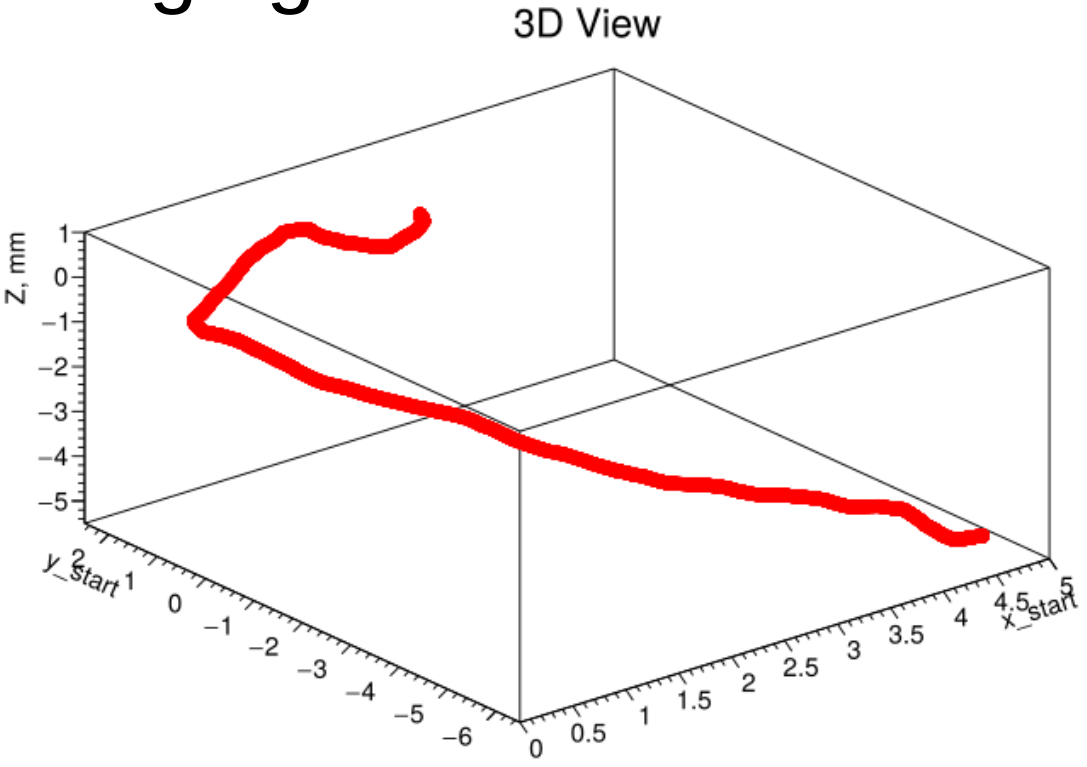
Can **repeatedly** absorb a visible photon from external excitation light source and fluoresce
Eventually turns OFF after emitting >1000 photons

An electron creates electronic excitations of the solvent, which in turn transfers energy to solutes as in a scintillator. With this dye in solution, a track of active fluors is created along the path of the electron, which can be read out later by exciting fluorescence with an external light source.

Kakishi Uno, Hiroyuki Niikura, Masakazu Morimoto, Yukihide Ishibashi, Hiroshi Miyasaka, and Masahiro Irie. In situ preparation of highly fluorescent dyes upon photoirradiation. Journal of the American Chemical Society, 133(34):13558–13564, 2011.

Imaging

Switched-on fluors are produced at the track and stay near the track
Liquid diffusion is slow-- D << (0.1 mm)^2/s in relevant solvents
The energy resolution may be improved to due the higher efficiency of counting active fluors instead of counting photons
Detailed imaging of the electron track(s) is possible



Simulation of ^{130}Te event in detector similar to KamLAND-Zen