Charge Recombination in Core/Shell Photoanodes

Scientific Achievement

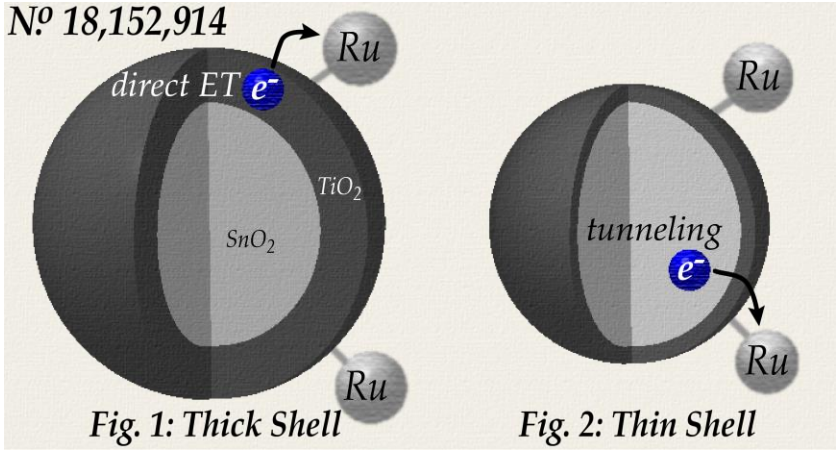
Charge recombination in SnO_2/TiO_2 core/shell films was found to proceed via two competitive mechanisms that depend on the shell thickness.

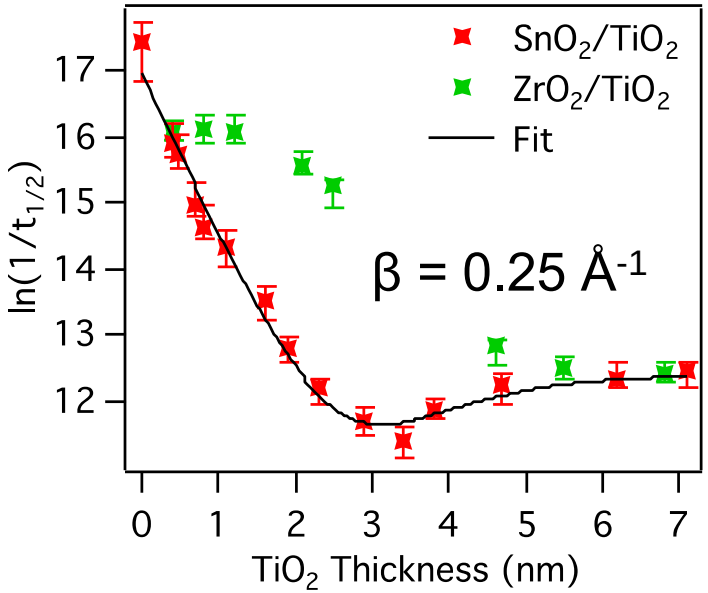
Significance and Impact

TiO_2 can act as a tunneling barrier for charge recombination and attenuate back electron transfer. However, with thicker shells, an increasingly larger number of injected electrons remain localized in the shell and recombine rapidly with the oxidized dye. These effects must be balanced to optimize charge separation.

Research Details

- For shell thicknesses between 0 and 3.4 nm, BET proceeds predominantly by a tunneling mechanism, with β=0.25 $Å^{-1}$.
- For shell thicknesses greater than 3.4 nm, the primary recombination mechanism involves electrons localized the TiO_2 shell.





Knauf, R. R.; Kalanyan, B.; Parsons, G. N.; Dempsey, J. L., Charge Recombination Dynamics in Sensitized SnO_2/TiO_2 Core/Shell Photoanodes, **2015**, *Submitted.*

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