Plasmonics: from light absorption to charge generation and utilization

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The efficient conversion of light energy into chemical energy is key for sustainable human development. Plasmon hot carriers' processes have attracted intense interest in the areas of photovoltaics, solar fuels, photoredox chemical synthesis, and degradation. The direct utilization of hot carriers is restricted by their ultrafast charge relaxation and recombination. A popular strategy to extend the hot carrier lifetime is to transfer them to suitable acceptors, such as n- and p-type semiconductors (also called sensitization), that can extend the lifetime of the hot electrons and holes, respectively, before their cooling. Since the relay semiconductors commonly have low catalytic activities, the hot carriers are frequently transferred to a catalytic site, where the reactions will take place. This lecture covers aspects related to hot carrier formation in plasmonic nanomaterials[1], dynamics of individual and simultaneous charges (electrons and holes) transfer[2-4], and their utilization in photoredox processes[5,6].

References

1. J. Sá, G.Tagliabue, P. Friedli, J. Szlachetko, M. H. Rittmann-Frank, F. G. Santomauro, C. J. Milne, H. Sigg, *Energy Environ. Sci.* **2013**, *6*, 3584.
2. Y. Hattori, M. Abdellah, I. Rocha, M. Pavliuk, D. L. A. Fernandes, J. Sá, *Mater. Today* **2018**, *21*, 590.
3. G.Tagliabue, J. S. DuChene, M. Abdellah, A. Habib, D. J. Gosztola, Y. Hattori, W.-H. Cheng, K. Zeng, S. E. Canton, R. Sundararaman, J. Sá, H. Atwater, *Nat. Mater.* **2020**, https://doi.org/10.1038/s41563-020-0737-1
4. Y. Hattori, M. Abdellah, J. Meng, K. Zheng, J. Sá, *J. Phys. Chem. Lett.* **2019**, *10*, 3140.
5. M. V. Pavliuk, A. B. Fernandes, M. Abdellah, D. L. A. Fernandes, C. O. machado, I. Rocha, Y. Hattori, C. Paun, E. L. Bastos, J. Sá, *Sci. Rep.* **2017**, *7*, 8670.
6. L. van Turnhout, Y. Hattori, J. Meng, K. Zheng, J. Sá, *(submitted)*.