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Trap State Introduction versus Band Gap Narrowing in Nitrogen-Doped $La_2Ti_2O_7$ BRANDON YOST, SCOTT CUSHING, NIANQIANG WU, ALAN BRISTOW, West Virginia University — Nitrogen doping was reported to extend lanthanum dititanate's (LTO), $La_2Ti_2O_7$, absorption from 380 nm to 500 nm by narrowing the band gap without introducing trap states [1]. N-LTO holds promise for solar water splitting if, unlike in N-doped TiO_2, spectral coverage can be increased without decreasing carrier lifetimes and decrementing the overall performance. Therefore, in this presentation, the effect of N-doping on LTO is confirmed using transient absorption spectroscopy with a supercontinuum and THz probe. The supercontinuum probe reveals carrier evolution in both band edge and mid-gap defect states. By exciting above and below the band edge, the influence of N-doping on the density of trap states is directly compared to the band edge position. Further, comparison of dynamics measured with the supercontinuum and THz probes reveals which changes in lifetime correspond to increased mobility or increased trapping, showing how the shifted band edge modifies carrier dynamics, and that N-doping in LTO is an efficient strategy for solar energy harvesting.

[1] F. Meng, et. al. Nano Res., 5, 213 (2012).

Brandon Yost
West Virginia University

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