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Tuning optical absorption and photoexcited recombination dynamics in $La_{1-x}Sr_xFeO_{3-\delta}$ through A-site substitution and oxygen vacancies[1] SERGEY SMOLIN, MARK SCAFETTA, AMBER CHOQUETTE, Drexel Univ, MATTHEW SFEIR, Brookhaven National Lab, JASON BAXTER, STEVEN MAY, Drexel Univ — We study optical absorption and recombination dynamics in $La_{1-x}Sr_xFeO_{3-\delta}$ thin films, uncovering the effects of tuning nominal Fe valence via A-site substitution and oxygen stoichiometry. Variable angle spectroscopic ellipsometry was used to measure static optical properties, revealing a linear increase in absorption coefficient at 1.25 eV and a red-shifting of the optical absorption edge with increasing Sr fraction. The absorption spectra can be similarly tuned through the introduction of oxygen vacancies, indicating the critical role that nominal Fe valence plays in optical absorption. Dynamic optoelectronic properties were studied with ultrafast transient reflectance spectroscopy, revealing similar nanosecond photoexcited carrier lifetimes for oxygen deficient and stoichiometric films with the same nominal Fe valence. These results demonstrate that while the static optical absorption is strongly dependent on Fe valence tuned through cation or anion stoichiometry, oxygen vacancies do not appear to play a significantly detrimental role in the recombination kinetics.

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