Experimentelle Physik 2

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Excitons or Free Carriers? Revisiting Photoluminescence in Lead Halide Perovskites

Daniel Gau

Instituto de Física, Universidad de la República, 11300, Montevideo, Uruguay

A detailed understanding of photogenerated charge carriers in lead halide perovskites is essential for advancing the rational design of optoelectronic and photovoltaic devices. In this work, we investigate the photophysical origin of photoluminescence in different representative perovskite systems. By combining temperature-dependent steady-state absorption and photoluminescence measurements, we probe the nature of the photogenerated species across different material classes. The experimental results are compared with predictions based on the Saha model, commonly used to describe the equilibrium between excitons and free carriers. While the model captures general trends, clear deviations arise in experimental results.

Reference

Gau, Daniel L., et al. "Origin of photoluminescence and experimental determination of exciton binding energy, exciton-phonon interaction, and urbach energy in γ-CsPbI3 nanoparticles." *Journal of Luminescence* 257 (2023): 119765.