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DEPARTAMENTO DE QUÍMICA FÍSICA
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Combining THz and Fluorescence ultrafast time-resolved spectroscopies in the study of 2D perovskites

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The combination of different ultrafast time-resolved spectroscopy techniques with complementary observables can be very helpful in the characterization and understanding of photoexcited dynamics. Time-resolved THz spectroscopy (TRTS) and fluorescence up-conversion spectroscopy (FLUPS) are a good example of such combination that can be employed in the study of charge carriers and excitons, for example, in quantum confined semiconductor materials used in optoelectronic applications. As an introduction, we will detail the basics of both techniques. Then, we will apply them to the study of two-dimensional lead halide perovskites, a heavily quantum and dielectrically confined family of materials where monolayers of perovskite structure are separated by bulky organic cations. This produces a large enhancement of the exciton binding energy and a general blue-shift of the absorption and emission spectra when compared to the bulk perovskite material. FLUPS is sensitive to the emissive excitonic states while both charge carriers and excitons show distinctive spectra in the THz region. Through these techniques, we find that a sequential cooling and exciton formation best explain the observed dynamics, where exciton-exciton interactions play an important role in maintaining a certain population of carriers through Auger heating. The resulting kinetic modelling and experimental procedure can then be used to compare different compositions.

Se ruega enviar un correo a fernandm@ucm.es antes del martes 25 si se está interesado en acceder vía telemática.