Angers, le 10 juin 2026

AVIS DE SOUTENANCE DE THÈSE

DOCTORAT (Arrêté du 26 août 2022 modifiant l'arrêté du 25 mai 2016)

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candidate au diplôme de Doctorat de l'Université d'Angers, est autorisée à soutenir publiquement sa thèse

le June 29, 2026, à 12:00
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sur le sujet suivant :

Photovoltaic and nonlinear optical effects of thin films based on perovskites

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Résumé de la thèse

This dissertation studies selected thin film hybrid perovskites with the MABX3 structure, whereB = Pb, Cd, Ge, Sn, Zn, and X = I, Cl, Br. The materials were synthesized by physical vapor co-deposition (PVco-D) and then characterized using a variety of techniques, including atomic force microscopy (AFM), UV-VIS-NIR spectrophotometry, photoluminescence (PL) spectroscopy, second- and third-harmonic generation (SHG, THG), Z-scan, and electrical and photovoltaic measurements. These studies provided detailed information on the effect of chemical composition and composition percentage on the surface topography, structural stability, linear and nonlinear optical properties, and electrical parameters of perovskite solar cells. The studies demonstrated that the stability of perovskites strongly depends on their chemical composition, with materials containing I and Br atoms proving to be the most stable. Spectroscopic measurements over a wide temperature range confirmed the occurrence of phase transitions –from orthorhombic to tetragonal and from tetragonal to cubic. The strongest second-order nonlinear properties were observed for the perovskite containing the Br halogen. Third-order nonlinear effects were observed for all tested materials. Thin film photovoltaic cells with perovskites containing I, Cl, and Br halogens responded to illumination by generating an electrical voltage and achieving efficiencies of 3.43%, 2.80%, and 3.55%, respectively.