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| **Title:** | Elucidating the effects of Cr–S variations in Cr-doped CZTS for intermediate band solar cell applications | | | |
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| **Abstract:** | |  | | |
| Intermediate band (IB) materials, such as chromium-doped Cu2ZnSnS4 (CZTS:Cr) show promise for surpassing the Shockley-Queisser limit in solar cells. This study explores the effects of sulphur variation in this film. Sulphurization results in a layered structure, with Cr-poor micron-sized grains on top and Cr-rich nanograins at the bottom preventing complete crystallization. Optimization improves the Cu2ZnSnS4 (CZTS) crystallization and introduces additional absorption peaks at 1.15 eV and 1.31 eV, alongside the fundamental 1.55 eV absorption using 47.1 mg of sulphur content. CZTS:Cr device fabricated achieve a threefold increase in current density (Jsc) compared to undoped samples. These findings are crucial for advancing intermediate band solar cell (IBSC) based on CZTS:Cr IB material. | | | | |