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Plasma-assisted molecular beam epitaxy growth of $ZnSnN_2$ NATHANIEL FELDBERG, JAMES ALDOUS, YUAN YAO, IMTIAZ TANVEER, BENJAMIN KEEN, University at Buffalo, WOJCIECH LINHART, TIM VEAL, University of Warwick, YOUNGWOOK SONG, ROGER REEVES, University of Canterbury, STEVE DURBIN, University at Buffalo, UNIVERSITY AT BUFFALO TEAM, UNIVERSITY OF WARWICK COLLABORATION, UNIVERSITY OF CANTERBURY COLLABORATION — The Zn-IV-nitrides are a promising series of "earth abundant element" semiconductors with a predicted band gap range of 0.6 eV to 5.4 eV, which, like the (Al,Ga,In)N family, spans the entire visible solar spectrum. Considering this alternative family has a number of advantages, including the avoidance of indium, the price of which has varied almost an order of magnitude over the past decade, and surface electron accumulation which is present in the In-rich alloys. Not all members of this family have yet been synthesized, in particular $ZnSnN_2$, the most important member for PV with its predicted band gap of approximately 2 eV. We have successfully grown a series of these films using plasma-assisted molecular beam epitaxy using elemental Zn and Sn sources. In this report, we discuss the relationship between process parameters and microstructure, as well as stoichiometry as determined by Rutherford backscattering spectrometry. Additionally, we provide preliminary estimates for its bandgap energy based on photoluminescence and optical absorption.

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