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Theoretical and experimental investigation of spontaneous emission from GeSn and SiGeSn alloys E. GHANATI, Z. LI, University of Dayton, T. TRAN, Australian National University, B. WANG, Y. K. YOE, Arizona State University, J. S WILLIAMS, Australian National University, I. AGHA, J. MATHEWS, University of Dayton — Silicon-based infrared lasers have long been an area of interest, but the realization of such devices has yet to be achieved. Sn-based alloys present a possible solution to this problem. The binary alloy GeSn and the ternary alloy SiGeSn have band gaps in the infrared, and these materials are being grown on Si substrates. Thus these combinations have the capacity for being a cheap and available alternative for lasers/detectors in IR/MIR region. In this work we studied spontaneous emission of the binary/ternary structures both theoretically and experimentally. We use a modified van Roosbroeck-Shockley expression to model the spontaneous emission spectrum from GeSn and SiGeSn, which depends on the band gap, the strain in the material, the excess carrier density, and the temperature. The results of the model are compared to photoluminescence measurements obtained from GeSn and SiGeSn materials, and the model is found to match the experimental data in most cases.

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