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InSb epilayers and quantum wells grown on Ge(001) substrates by MBE MUKUL DEBNATH, TETSUYA MISHIMA, MIKE SANTOS, University of Oklahoma, KHALID HOSSAIN, WAYNE HOLLAND, Amethyst Research Inc., UNIVERSITY OF OKLAHOMA TEAM, AMETHYST RESEARCH INC. COLLABORATION — For digital logic applications, transistors with both electron and hole channels are required. InSb:Ge heterostructure is an ideal material since the highest carrier mobilities for n and p-type quantum wells (QWs) are observed in InSb and Ge channels, respectively. We report on the MBE growth of InSb-based materials on Ge(001) substrates. A temperature variation two-step growth procedure (TSGP) is more effective than direct growth of InSb on Ge(001). In the TSGP, an initial 100-nm InSb layer was grown at a temperature of 340°C before increasing the substrate temperature to 420°C for the rest of the growth. The initial growth forms a wetting layer that minimizes defects at the InSb/Ge interface. The X-ray rocking curve width of a 5.0-μm-thick InSb epilayer is 173 arc sec. Electron mobilities of a 5.0-μm-thick InSb epilayer and an InSb/$Al_{0.20}In_{0.80}Sb$ QW at room temperature are 34,500 and 8,600 cm^2/V-s, respectively. These are the highest mobilities for an InSb epilayer and QW on Ge(001) substrates reported so far. This work was supported by NSF Grant DMR-0520550 and OCAST contract AR071-025.

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