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Electrical Properties of 2D $Si_{1-x}Ge_x$ alloys by ultra-fast thermal annealing C.H LEE, Q.Y. CHEN, P.V. WADEKAR, W.C. HSIEH, C.F. CHANG, Department of Physics, National Sun Yat-Sen University, Kaohsiung, H.C. HUANG, Department of Material Science and Optoelectronics, National Sun Yat-Sen University, C.M. SHIAU, Y.S. HONG, Y.P. CHENG, C.Y. DANG, P.C. KUNG, Y.Y. LIANG, S.H. HUANG, Z.Y. WU, C.M. LIN, S.T. YU, L.W. TU, Department of Physics, National Sun Yat-Sen University, Kaohsiung, N.J. HO, Department of Material Science and Optoelectronics, National Sun Yat-Sen University, H.W. SEO, Department of Physics, Jeju National University, W.K. CHU, Texas Center of Superconductivity and Department of Physics, University of Houston — Ultra-fast thermal processing has been used to acquire 2D $Si_{1-x}Ge_x$ alloys of different x-values and effective thicknesses. X-ray reflectivity (XRR) data were analyzed with a three-layer model to obtain the thickness, roughness, mass density, and thus also the compositions. Comparison was then made with direct TEM imaging and SIMS depth profiling. The electrical properties according to the RT curves demonstrate semiconducting behaviors, as judged by their negative temperature coefficients, fit well with a functional of dual-energy Arrhenius relation representative of band conduction mechanisms. The extracted activation energies correspond to the mid-gap levels contributed by mutual alloying. The carrier concentrations, mobility and magnetoresistive behaviors will be discussed in relation to the material processing conditions for the 2D alloys.

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