

PECULIARITIES
OF NUCLEATION AND ORDERING OF GeSi
NANOISLANDS IN MULTILAYER STRUCTURES
FORMED ON Si AND $\text{Si}_{1-x}\text{Ge}_x$ BUFFER LAYERS

*V.O. Yukhymchuk¹, M.Ya. Valakh¹, V.P. Kladko¹,
M.V. Slobodian¹, O.Yo. Gudymenko¹,
Z.F. Krasilnik², A.V. Novikov²*

¹V. Lashkaryov Institute of Semiconductor Physics,
Nat. Acad. of Sci. of Ukraine
(41, Prosp. Nauky, Kyiv 03028, Ukraine
e-mail: kladko@isp.kiev.ua)

²Institute for Physics of Microstructures,
Russian Academy of Sciences
(GSP-105, Nizhny Novgorod 603600, Russia)

S u m m a r y

High resolution X-ray diffraction (HRXRD), Raman scattering (RS), and photoluminescence (PL) methods have been used to study the influence of $\text{Si}_{1-x}\text{Ge}_x$ buffer layer parameters on the spatial ordering of self-assembled Ge nanoislands in multilayer SiGe/Si structures grown on Si (001) substrates. The thickness and the composition of a $\text{Si}_{1-x}\text{Ge}_x$ buffer layer are shown to affect the lateral ordering of nanoislands owing to the different sensitivities to the ordered strain modulation in the layer surface. The spatial ordering is found to be governed exclusively by the lateral ordering in the first period of the superlattice (SL). It is demonstrated that, in the case of thick $\text{Si}_{1-x}\text{Ge}_x$ buffer layers with a considerable Ge content, a plastic relaxation is accompanied by the emergence of mismatch dislocations at the interface, when the SL layers are coherent to the buffer one. The complex researches of the corresponding structural and optical characteristics allow us to develop methodological approaches to the study of the nanoisland ordering in the SL.