MEMORY EFFECTS OF HETEROSTRUCTURES ON THE BASIS OF POLAR-ACTIVE NANOFILMS

A.N. Morozovska, G.S. Svechnikov

V. Lashkaryov Institute of Semiconductor Physics
Nat. Acad. of Sci. of Ukraine
(*Prosp. Nauky, Kyiv 03680, Ukraine*)

S u m m a r y

Modern achievements of information technologies depend on high-rate and high-capacity devices with energy-independent memory. At the present time, various alternatives to modern memory units are intensively studied with the aim to develop more powerful functional devices. The survey is devoted to the modern state of theoretical studies of the memory effects of heterostructures on the basis of polar-active nanofilms and their applications: the energy-independent memory on the basis of ferroelectric nanofilms, resistive ferroelectric diodes and field transistors, memory on arrays of nanodomains and conductive domain walls, resistive memory with free-running access based on the phenomenon of switching of the resistance of nanofilms made of oxides of transition metals, and memristor memory. A significant attention is paid to the continual theory of charge, field, and hysteresis characteristics of heterostructures on the basis of memristor nanofilms, ionics, and solid electrolytes and to the influence of size effects on the switching of the spontaneous polarization in nanoheterostructures of the ferroelectric–semiconductor type. The main mechanisms of switching of the polarization and the resistance in polar-active nanofilms such as the electric, electromigrative, and deformational ones are considered.