B. N. Goshchitskiĭ. *Nonequilibrium state of defective ordered crystals.* The physical properties of ordered crystals depend extremely sensitively on the degree of ordering in the arrangements of the various species of atoms at the various points of the crystal lattice. Nuclear phenomena are now being used more and more often to produce disorganized states. In crystals, it is possible in this way to bring about a "physically pure" disordered state that it is impossible to obtain in many cases by traditional technological devices. In this state, the crystals retain their stoichiometric composition and are homogeneous in bulk, and the atoms of the various species are statistically distributed among the nodes of a perfect crystal lattice.

The properties of crystals in this thermodynamically off-equilibrium structural state are clearly unusual. Essentially, the procedure produces stable materials with new and hitherto unknown properties. Thus, for example, the Curie points of certain ferrites are increased by hundreds of degrees, and resistivity may change through several orders of magnitude. Soft nickel ferrite in this state becomes a magnetically hard material with a coercive force of the order of magnitude of a thousand oersteds; zinc ferrite becomes a ferromagnetic with $T_k = 620$ K. In magnesium chromite, which initially has a spinel structure, a type B_1 structure is brought about: the chromium ions remain at the "regular" octahedral nodes, while the magnesium ions are statistically redistributed among tetrahedral nodes and octahedral nodes that were "forbidden" in the spinel structure. In this state, the temperature of the superconductive transition in intermetallides with A-15 structure may decrease or increase by nearly an order of magnitude or change little. In these compounds the sign of the temperature coefficient of resistivity changes with no change in crystalline structure. Elastic anisotropy disappears in V_3Si, something that is seldom observed even in pure metals.

The study of crystals in this unusual structural state is opening a new trend in research into the fundamental properties of solids. For example, values of the exchange interaction of Fe^{3+} ions at tetrahedral and octahedral nodes in the spinel lattice have been determined in this way, and the energy of preference of the zinc and magnesium ions for octahedral points in zinc and magnesium ferrites has been found. In nickel ferrite, the magnetic moment of the Ni^{2+} ion at a tetrahedral position and its contribution to the magnetic crystalline anisotropy have been determined.

[1]Yu. G. Chukalkin and B. N. Goshchitskiĭ, in: Fizicheskie svoĭstva magnitnykh materialov (Physical Properties of Magnetic Materials). USSR Academy of Sciences Ural Scientific Center, Sverdlovsk, 1982, p. 135.

[2]V. N. Goshchitskii, Fiz. Met. Metalloved. **48**, 707 (1979).

[3]V. E. Arkhipov, V. I. Voronin, A. E. Kar'kin, and A. V. Mirmel'shteĭn, in: Tezisy dokladov na 21-m Vsesoyuznom soveshchanii po fizike nizkikh temperatur (Abstracts of Papers at 21st All-Union Conference on Low-Temperature Physics). Khar'kov, 1980, Part 1, p. 264.

S. M. Klotsman. *Structure, properties, and interactions of point defects and their influence on radiation-stimulated phenomena in metals.* 1. The principal changes in the properties of real materials that work under irradiation result from: a) accumulation of primary radiation-induced defects (RDs) and their transformations to secondary RDs; b) precipitation and solution of phases and redistribution of phases in space, clearly a result of diffusion processes that take place under extreme conditions. Of the many phenomena that occur under irradiation, we shall single out *radiation-stimulated segregation* (RSS) *and redistribution of alloy components under irradiation and radiation-induced embrittlement.*

2. The self-interstitial, the structure of which is determined from the diffuse and background scattering of x-rays,[1] is a dumbbell with [100] orientation in fcc crystals and [110] orientation in bcc crystals. When a self-interstitial forms, resonant modes with frequencies around 0.1 ω_{max} appear in the vibrational spectrum of the crystal. This accounts for the surprisingly high mobility of self-interstitials: they migrate through the crystal even at helium temperatures.[2] In this process,