This project concerns the study of a new generation high-induction ($B_{max}$> 1.5T) nanocrystalline soft magnetic materials in which the process of nanocrystallization from the glassy state is rapid and occurs during ultra-fast processing also is called the "flash annealing" or "rapid annealing". The mechanism of this process differs from the typical classical nanocrystallization of previously known soft magnetic materials. The aim of this project is to examine the magnetic properties, crystal structure and magnetic structure in the context of the crystallization process of a new generation of high-induction nanocrystalline soft magnetic materials with general formula $(Fe, Co)_{100-xy-z}Nb_xB_y(Cu_z)$ ($0\leq x\leq 7$, $5\leq y \leq 15$, $0\leq z\leq 1.5$). The expected result of this project will give the new knowledge about the mechanisms of the multistage crystallization process and changes in the crystal and magnetic structure as a function of chemical composition presented as a map of the magnetic parameters ($B_{max}$, $H_c$ and P) as a function of elements responsible for crystallization (Cu and Nb), as well as a map of magnetic parameters ($B_{max}$, $H_c$ and $P_w$) as a function of ferromagnetic elements (Fe, Co) to maximize $B_{max}$ and minimize $H_c$ and $P_w$. The acquired knowledge on the correlation of magnetic properties, crystallization kinetics, including the evolution of the magnetic domains and the crystal structure at the atomic level will allow to propose new materials for a high-performance and ecological power electronics.