## CONCLUSIONS

As a result of the research, the powder soft magnetic material based on iron alloyed with 5% silicon was obtained. The influence of technological regimes on the structure, chemical and phase composition, hardness and magnetic properties of the material was studied. According to the investigation, the following conclusions can be made:

– it was found that the addition of silicon to iron powder leads to an increase in total porosity by 3–5% throughout the whole range of compaction pressures;

– the influence of porosity on the magnetic properties of the material was examined. Reducing porosity to 10–12% leads to higher magnetic characteristics – relative saturation magnetization to 100–120 G $cm^3$/g, coercive force to 280–320 A/m;

– it was determined that recompaction of samples at pressure of 700 MPa after annealing aligns density of the pre-compressed at different pressures samples, and their porosity is 7,5–10%;

– the effect of sintering temperature on Fe–Si materials porosity was investigated. It was established that the porosity minimum for the samples compressed at pressure of 700 MPa after sintering is about 4.5% for the temperature of 1300 $^0$;

– the investigation of the magnetic characteristics of the materials sintered at different temperatures showed that the materials obtained at 1300 $^0$C (being measured at indoor temperature) have higher values of magnetic properties: their relative saturation magnetization is 160–170 G $cm^3$/g and coercive force is about 260–280 A/m;

– the rearrangement of silicon between iron samples during vacuum sintering was found and the kinetics of samples weight loss and decrease of hardness during sintering were studied;

– a detailed analysis of the process of silicification of Fe–Si powder materials has been carried out and a comprehensive study of the influence of Fe–Si backfill composition on the structure, magnetic properties, and electrical resistivity in constant and variable magnetic fields was made. The perspectiveness of using $SiO_2$ – 98% + Si 2% backfill for obtaining materials with high values of saturation magnetization and at the same time with low magnetic loss at alternating magnetization was shown;

– scientific and technical relevance and economic feasibility of the research done are validated;

– the measures ensuring healthy working conditions and principles of safety in an emergency are elaborated.