Problems associated with the description of the ‘way’ by which the global texture of the deformed state is transformed into the recrystallized one, as so far, is still not complete.

The aim of this project is to recognize and describe the mechanisms of the transformations taking place during annealing of deformed face centered cubic (fcc) metals of a medium and high stacking fault energy (SFE)**. The mechanism of strong cube texture formation which is responsible for strong anisotropic properties of sheets and plates will be at the heart of interest.** The novelty of the research program results from it complex character, which aimed to unambiguous documented mechanism governing the cube grains nucleation in fcc metals.

The finishing stages of sheet manufacturing are completed by means of cold rolling, usually up to large deformations. These processes lead to a high strengthening of the metal accompanied by significant structural changes and the formation of new sharp texture components of the deformed state. Subsequent heat treatment (annealing) leads to a complete transformation of the texture components. *Most of earlier works on this subject has been based on experiments with polycrystalline materials. In the author's view such an approach to analysing the mechanisms of texture transformation is very difficult due to multiple factors influencing the process.*

The issues raised in the project are inspired by real problems faced in the industrial practice. In order to clarify this problem, it is advisable to perform experimental research under conditions where the number of free parameters affecting this transformation is minimized. Therefore, the following series of experimental investigations has focused on a model analysis of transformations which occur in single crystals, with precisely selected orientations. This approach to analysing the problem makes its description simpler and clearer. The deformation will be carried out by plane strain compression to simulate the rolling process of thin sheets. Basically, the analyses will be performed on single crystalline samples of S{123}<634> - and cube{100}<001> - orientations and next, the obtained results will be referred to those obtained on polycrystalline materials – technical purity Al, e.g. AA1xxx series alloy and Cu, deformed along two deformation modes to create different ‘texture images’. It is expected that *the absence of S component in the as-deformed state can be correlated with the absence of cube texture after annealing*. This is the eternal problem that has been pointed out several times and can be clearly solved only by experiments on single crystals of S orientation.

The main scientific contribution of this project is development of a conceptual framework for the phenomenological description of the mechanisms of cube grains nucleation during annealing and determination of the conditions of their growth in deformed metals. In the proposed series of research, the key issue is the relation between the observed state of the structure/texture and the mechanical properties. **The above issue is the classic ones in the field of material engineering, concerning the research which is basic and cognitive in character, and the solution to which should significantly contribute to extending the knowledge on the mechanisms controlling the mechanisms of the texture formation during recrystallization.** From further perspective, understanding of the mechanisms of the formation of texture transformation during annealing will contribute to the development of production of flat (semi)products in an intelligent manner. This is the basis of the ability to consciously control the (micro)structural and textural changes which take place during the final stages of the cold-forming processes and which basically affect the transformations occurring in the annealing process. **This indicates that the raised issues are significant not only from the scientific point of view, but they are also important for the industrial practice.**