The main aim of the project is an analysis of the reaction between components of the aluminum, glassy carbon and titanium system. Aluminum with carbon system are common analysed and described by many researchers because of advantageous properties of these materials. However, this materials has a very unfavourable tendency to reaction between the components and create aluminum carbide phase. This phase is extremely undesirable because it is metastable phase under normal conditions, and its appearance in the material leads to a reduction of its properties. Many authors have been tried to solve this problem. Many studies show that in order to avoid undesirable phase the short contact time between carbon and aluminum in liquid form is recommended. Thus, in practice, a tendency to reduce a time and a temperature during processing can be observed. Another proposed solution to this problem is the introduction of an additional component to the Al-C, which is titanium. The introduction of this element leads to a controlled reaction between titanium and carbon to form titanium carbide phase, thereby eliminating the aluminum carbide phase. The amount of titanium in this systems should correspond to the stoichiometric balance of the substrates, what ensured that all of the carbon in the system appear only as a component of TiC (no pure carbon).

The proposed solution is to introduce the titanium into Al-C system in the form of sealed layer on the surfaces of the carbon contained in the aluminum matrix. This solution allows the reduction of undesired aluminum carbide phase, while maintaining the carbon in a pure state (not reacted). This is possible by using a two-step process to produce such materials. Titanium in the form of a powder is introduced into the phenolic resin, and then the both components are subjected to a pyrolysis process. The result of this process is to produce carbon elements, tightly covered by a layer of titanium. In the next step, prepared C-Ti system is introduced into the liquid aluminum. The main objective of the research is to determine the reactions in the presenting system. The analysis will focus particularly on the areas of phase boundaries C-Ti and Ti-Al, as the areas with the greatest potential to create new phases. Identification of new phases present in a material will be possible due to analysis by microstructural (SEM) analysis and phase composition measurement (XRD, TEM). Moreover, these materials will be subjected to a controlled process temperature rise in a scheduled period of time. Based on previously conducted thermogravimetric analysis (TGA method), the potential ranges of temperature reaction between components will be designated. The results will be compared to the results obtained by the thermodynamic theoretical considerations. For this purpose, the program HSC hemistry will be used. The obtained results will give an opportunity to better understanding of the phenomena occurring in the system Al-Ti-C, as a function of the temperature and time. An important factor in the testing system is also the presence of a significant amount of carbon in pure form, while avoiding undesirable aluminum carbide phase. The presence of atoms in a pure form lead to obtain material properties which are impossible to obtain using other elements. Another aim of the study is to determine changes in the basic material properties such as density, porosity, hardness as a result of temperature influence in period of time.