Development of the renewable energy techniques is necessary to provide a proper standard of living for the society while decreasing the negative impact of the civilisation on the environment. All of the currently applied technologies are still struggling with a number of imperfections and difficulties in exploitation. Biomass gasification, that is thermal conversion of the organic renewable solid fuel into a combustible gas, is one of the most popular pathways in clean energy production, mainly because of a good accessibility of biomass sources, the possibility of its utilisation locally in small scale installations and the low costs of the fuel storage. The main problem standing it the way of the further popularization of this technology is the amount of tars that are created during the process, hindering and sometimes utterly precluding the utilisation of the synthesised gas.

The gasification process occurs in high temperatures, limited access to oxidising agent and it consists of three main stages, namely:

1) drying of the fed fuel

2) devilatilisation, that is releasing lighter, more volatile fuel compounds as a result of the high temperature while compounds more intertwined to each other remain in the solid form called char

3) slow gasification of the remaining char, that is slow heterogeneous reaction between the solid and oxidising agent.

Tar, being essentially the mixture of aromatic hydrocarbons, is released during the devolatilisation stage. It was noticed that remaining char has the ability to remove tars getting in contact it, as well in-situ in the reactor as in the separate reforming reactor with the formerly prepared bed of char.

In the previous scientific researches the main concern was the influence of the surface area and porosity of the char on its ability to tar removal. Simultaneously, chars from different types of biomass were compared, also influence of the alkali and alkaline earth metallic (AAEM) species on tar decomposition was considered. It is currently known that tar conversion is mainly a result of their adsorption, followed by coking) on its surface. In the next step, the decomposition of the created coke and the char itself proceeds through gasification, usually in reactions of steam reforming.

The issue never considered before was the determination of the influence of the acidity of the active sites present on the char surface on its ability to tar removal. It is known however that the acidity of the adsorbents inflict the enhanced hydrocarbons deposition on their surfaces. Therefore, in this project, the acidic properties of the char surfaces will be examined in the relation to its affinity to the common tar compounds adsorption. Another objective is to establish what effects on char surface structure have the extractives present in the maternal biomass. Despite the common beliefs that extractives comprises just of the light, thermally unstable compounds, it was proved that there are large amounts of fixed carbon remaining after the devolatilisation process and because of the rather distinctive differences between the extractives and main wood polymers, their presence can inflict the substantial differences in the created chars and their properties.

Designed research comprises of the preparation of chars from woody biomass, both fresh and extracted. Received material will be contacted with the chosen marker tar compounds in a heated, entrained flow reactor. During these runs the tar conversion parameters will be determined. Next, the fresh and spend chars will be examined in the acidity of active sites and types of bonds in their functionalities tests. Based on the received dependencies, the removal of tars on the char in relation to its surface structure and extractives amount in the maternal wood can be determined.

This subject of studies was brought up because of the fact that the knowledge on the effect that the acidity of active sites on a char surface and the char surface structure in relation to extractives presence on the effectiveness of tar compounds removal is vital to the proper understanding the tar removal process, hence the elimination of the main problem faced by biomass gasification.