The development of human civilization has always been connected to the development of new materials – frequently it took place accidentally but now it requires a lot of preliminary studies and planning. First of all, new materials found application as construction materials but also as materials for more sophisticated applications in medicine, optics, electro-technique and electronics. The latter have been used in many devices which are nowadays recognized as crucial for normal and comfortable day life of the human kind. This seems to be the origin of the term frequently used to describe properties of such novel material i.e. “functional materials”. They have found application in energy sources and screens of portable devices, medical equipment and many areas of human activity.

The development of new materials with specific properties forces the researchers and engineers to interconnect many components in a way that their properties overlap with each other to cause so called “synergistic effect”.

Basically, because of their origin materials can be divided into two main groups – inorganic and organic materials. Typical examples of inorganic materials can be metals and materials gained from rocks e.g. concrete. On the other hand organic materials are wood and natural fibers. The origin of materials, in the very first approximation, can be either inanimate matter as in the case of inorganic materials or animate matter in the case of organic materials. Research that have been done over last decades shows that in many cases the expected properties of new material can be achieved only when component coming from the two different groups are coupled into one single product. The materials produced this way frequently show specific properties not observed for their organic and inorganic components.

Unfortunately, global human population growth in connection to rapid increase of technical activity of humans has lead to gradual decrease of natural resources especially those of organic origin. taking into account ethical and economical needs, it becomes increasingly important to use waste materials coming from different areas of human activity.

The objective of the project is to meet (at least partly) those needs and solve problems we face on the way to developing new materials. To understand the idea behind this proposal, it is necessary to emphasize what is the chemical composition of organic mater that is being produced in biosphere due to photosynthetic and other biological processes. The highest fraction of the produced matter (biomass) is cellulose used mainly for making fibers. The second biggest fraction is lignin. Lignin is always connected to cellulose in wood and other plants. Unlike cellulose which after separation from its source such as wood can find applications in many areas of day life, lignin because of their poor mechanical properties is treated as a surplus to lignin and is mainly burned on plant i.e. it is used as energy source.

In this project waste lignin from paper industry in chemically modified form (lignosulfonated) is postulated as the component of new functional, hybrid, organic-inorganic materials for the application in electric and electronic systems. It is suggested to connect lignosulfonate with colored inorganic salts such as Prussian blue or its analogs.

Prussian blue is known to be electrically (more exactly electrochemically) active and hence can be used in the development of energy sources (batteries) or chemical sensors e.g. test strips on glucometers. On the other hand project leader has shown that similar properties can be assigned to lignin. Connecting the two components into one hybrid material would allow reclaiming huge amounts of technical lignins and producing new high value added products.