Light intensity controlled photoelectrochemical switches for pattern recognition

Motivation:

In the present world, a lot of attention is paid to the search for new solutions for information processing. From the human point of view, the most information from the world around us is provided by the sense of sight. Biologically, the normal life of humans begins cannot be separated from vision, and the content of vision depends on the light reflected on the surface of things. Evidence has suggested that humans receive the most information through the visual perception system. Therefore, the concept of using light for the conversion of information is very popular nowadays. Scientists try mimicking the human brain and use artificial synapses to build optoelectronic devices. Nerve synapses can transmit information, but they also can remember information. These properties mean that synapses can be used for pattern recognition. Chemicals could behave as nerve synapses and optical synapses could realize the interconversion between optical and electrical signals. It is very important and could develop the concept of bionic vision.

The aim of the project:

To achieve this goal, we need to combine 4 elements:

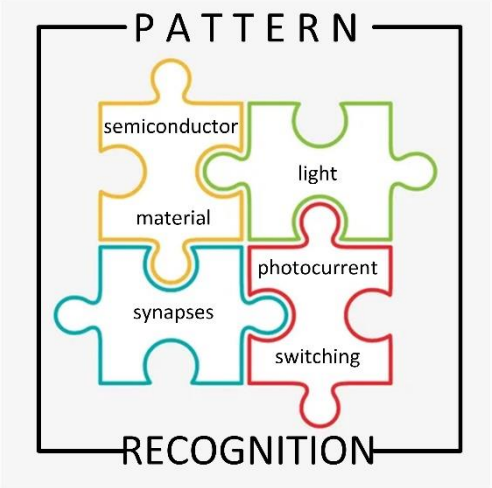
1. find the right semiconductor material,

2. choose the light of the appropriate length and intensity,

3. check a photocurrent switching effect

4. check the synaptic behavior of materials.

The key to success is to combine all these elements into one working device.



Research description:

The implementation of this project will include the synthesis of semiconductor materials by microwave synthesis and the sol-gel technique. The resulting materials will be in the form of nanocrystalline powders or thin layers. All materials will be thoroughly tested for purity, stability, spectroscopic and photoelectrochemical properties. Several materials will be selected for further research, for which advanced photoelectrochemical and neuromimetic tests will be carried out. The most promising material will be used to build a prototype device that recognizes simple patterns.

A "side effect" of the project will be to find new semiconductor materials that exhibit photocurrent switching effects and to understand their mechanisms of action, which will contribute to the advancement of semiconductor research.