Nanotechnology is one of the fastest-growing fields of science in recent decades. This is due to the fact that the properties of materials made of nanometer-sized elements have different properties than their macroscopic counterparts. For example, gold in the form of nanoparticles is red in color and was therefore used to color glass in antiquity. The explanation is that the electrons in these particles (nanoparticles) are trapped in a very small volume and strongly absorb light of a specific color. In the context of future applications, attention should be paid to chiral structures in which nanoparticles are arranged in such a way that the mirror image of the created structure is not identical to this structure (just like the right shoe does not fit the left leg). Due to the strong interaction with light and chiral structure, such systems can be used to build next generations of optoelectronic devices.

Unfortunately, the methods commonly used to obtain chiral nanomaterials are expensive and difficult to implement on a large scale. Moreover, they do not allow obtaining materials that could be precisely controlled by external factors such as light or an electric field. The aim of the REOPEN project is to develop methods of obtaining chiral materials made of metal elements with dimensions of several nanometers (Fig. 1) and to develop a new, unique technology for developing new chiral liquid crystalline phases. Within the frames of the project, a number of new organic compounds with high potential for the formation of chiral liquid crystalline phases will be obtained. They will serve as a matrix to arrange nanoparticles into a chiral structure and surface ligands. Importantly, the design of synthesized compounds will be supported by calculations using molecular modeling, accelerating the process of developing new materials. The resulting materials will be tested using a number of research techniques, including electron microscopy, atomic force microscopy, polarizing microscopy or X-ray methods. Ultimately, the resulting chiral materials will be used to construct prototypes of configurable light processing devices, such as tunable microlenses .

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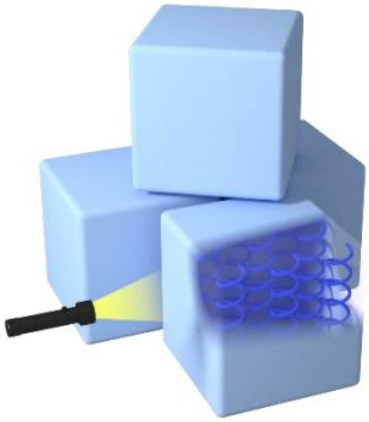

Figure 1. The idea behind the REOPEN project is to ‘open the eyes’ to new, chiral liquid crystalline phases and to obtain structures that exhibit plasmonic chirality.