Since several years there has been an increasing interest in so-called organic porous materials. Their structures are very specific, as they contain dense arrays of very small empty channels and other voids (their size is ca. a few nanometers or sometimes even less). Therefore, such materials possess a very extended surface. The presence of many voids in the structure is highly advantageous, because these substances are able to trap gases and other volatile small molecular compounds. Hence, they can be used as nano- containers for storage of significant amounts of various substances. This is especially interesting from the point of view of storage of gases having great practical importance (such as hydrogen or methane) as it allows to avoid the use of very low temperatures and/or high pressures. Another potential application is the separation of mixtures. It is based on the fact that components of a mixture are absorbed by the porous material to a different extent. This can be due to various factors including, for example, geometrical matching to pores possessing various size and shape or a relative affinity to the surface of the material. Porous materials can also be employed as catalysts (i.e, substances, which accelerate chemical reactions) or supports for catalysts. Due to an extremely large surface, their performance can be very effective. There are various types of organic porous materials. One of them is represented by so-called Metal Organic Frameworks (MOFs), which are build by metal ions (e.g., zinc, copper, iron, zirconium, etc.) linked by means of rigid organic fragments. The second important group are so-called Covalent Organic Frameworks (COFs), which can be described as specific organic polymers. They are composed of light elements such as carbon, hydrogen, boron, oxygen and nitrogen. On the other hand, COFs usually do not contain heavy metal atoms in their structures and therefore they can have very low density. In some cases, it can even drop below 0.2 $g \cdot cm^{-3}$, *i.e.*, it can be more than 5-fold lower than the density of water.

The project is focused on the development of new synthetic methods which will provide an access to various porous organic materials containing the boron atom. It is worth of noting, that organic boron compounds play an increasing role due to their utility in various fields of modern science. Nowadays, they are widely used in synthesis as convenient, versatile and easily accessible starting materials for the preparation of complex organic compounds possessing special properties, e.g., pharmaceuticals, optical materials, conducting polymers, etc. In 2010, the Nobel Prize in chemistry was awarded to Prof. Akira Suzuki from Japan for the discovery of the so-called Suzuki-Miyaura cross-coupling reaction, which is very popular method enabling relatively simple synthesis of many useful substances. In addition, there are also great hopes surrounding studies on biological applications and direct application of boron compounds in medicine. A good example is *Boron-Neutron Capture Therapy* (BNCT) used for the treatment of brain cancer. In addition, it was found that some organoboron compounds exhibit high antifungal, anti-inflammatory and antibacterial activity while simultaneously retaining low toxicity.

The application of boron compounds in synthesis of COFs enables many possibilities of designing structures featuring desired geometrical parameters, good sorption properties, and high stability even at temperatures exceeding 300-500 °C. However, there are precisely controlled formation of such materials is still rather difficult. As a result, their structural features and physicochemical properties can vary significantly. Therefore, the search for novel, improved, synthetic procedures is well founded. It seems that it would interesting to obtain also modified, which could be regarded as hybrids of MOFs and COFs, based on organoboron compounds and metal metal-containing precursors. A very important project task is of course the determination of sorption properties with respect to selected gaseous and other volatile substances. This would give a direct perspective of possible future practical applications in various technological processes.