

Phase-Transfer Catalysis in a High-Pressure-Flow Mode

One of the most important tasks of modern organic chemistry is fast and efficient synthesis of desired products (e.g., of pharmacological importance). Reaction conditions (for example temperature) leading to such products are subject to modification in order to achieve higher yield and purity. In recent decades, interest has been persistently growing in nonconventional methods of organic synthesis that seek to exploit other external variables, such as pressure. Exploration of this variable and raising the pressure up to **several thousand bars** (several kbars) opens up entirely new opportunities for organic synthesis. The application of high pressure in organic synthesis is known to make possible various reactions that do not proceed under atmospheric pressure (1 bar), even at elevated temperatures. Unfortunately, a major weakness of classic high-pressure methods lies in the fact that the operator only has knowledge of the input and output of the reaction. Consequently, the reactions that have already been tested in the stationary variant are still necessarily treated as “black boxes”.

However a recent technological leap forward in material engineering has made it possible to construct all the necessary elements of high-pressure-flow systems. In contrast to periodic (batch) processes, flow chemistry allows for the maintenance of precise reaction conditions, which can be altered gradually or rapidly.

We decided that we will investigate PTC reactions under high pressure using the flow chemistry approach to combine all the advantages of both techniques in order to obtain important product more efficiently. PTC (phase-transfer catalysis) is a well-known method of organic synthesis, which helps to make a contact between two chemical individuals dissolved in two different immiscible solvents, such as water and nonpolar organic solvent. This process can be distinctly accelerated when phase transfer catalyst is added. Phase transfer catalysis is widely used in chemical laboratories, as well as in industry. However, the influence of reagent contact time, overall concentration, etc. in the pressurized variant of flow technique, still remain to be determined.

Therefore, our **main goal is to glean deeper insight into PTC reactions proceeding under high pressure using the flow chemistry approach. For the first time we will investigate how the high pressure alters organic reactions conducted in biphasic regime. We will determine, whether a synergic effect takes place when high pressure is combined with flow technique and identify limits of both methods.**

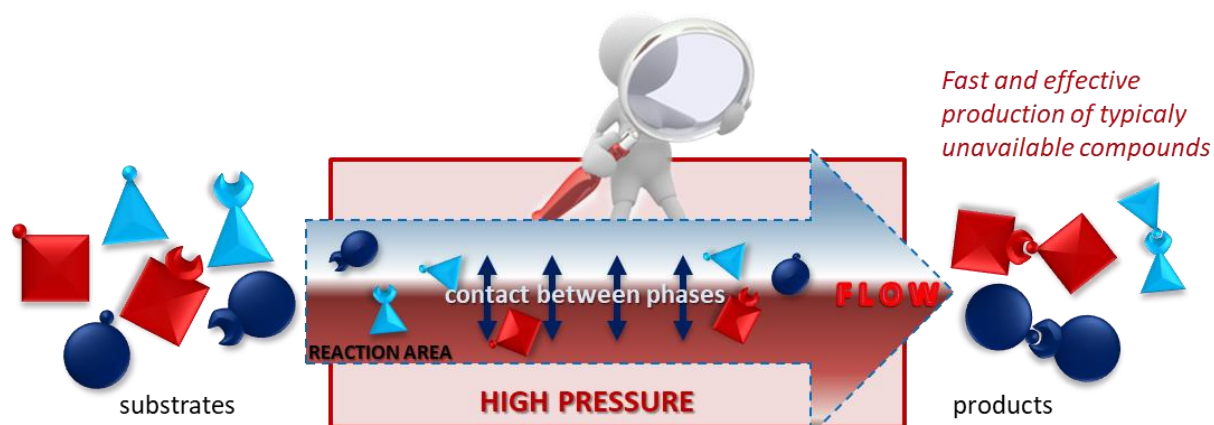


Figure 1. Overview of the methodology