

1. Research organization:  
University of Maribor (UM)  
Faculty of Chemistry and Chemical Engineering (FKKT)

2. Name and surname of the mentor:  
Maša Knez Hrnčič

3. Subsection of the field of study from:

- Po [šifrantu ARRS](#):

2.02 Chemical engineering

- EURAXESS Ortelius klasifikacije raziskovalnih področij:

15.5 Chemical engineering

4. E-mail address of the mentor:  
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5. Brief description of the training program:

Research will cover the separation of biologically active substances from plant sources that should replace synthetic compounds currently used in the food, pharmaceutical and cosmetic industries. Compounds such as polyphenols, fatty acids, antioxidants, colorants and enzymes with antioxidant and pharmacological effects will be investigated. The aim for isolation of these substances is based on their anti-microbial, anti-tumor, antioxidant, and antimutagenic potential. Conventional extraction processes involve the use of organic solvents and the presence of high temperatures, which adversely affects the stability of bioactive components. As an alternative to the conventional methods, isolation procedures with sub- and supercritical fluids will be considered.

The basic thermodynamic and transport properties substances in systems with sub- and supercritical fluids will be investigated. These data are crucial for the design and optimization of high pressure extraction processes. Within these investigations, the phase equilibria for multi-component systems at elevated pressures and temperatures in the presence of various media will be measured. Mass transfer and physical properties such as density, viscosity and surface tension will be experimentally attained. Based on the experimentally determined data, modeling using thermodynamic and empirical models will be performed. For extraction processes with supercritical fluids the optimal process conditions (solvent, material-solvent ratio, mixing, temperature, pressure) needed for the isolation and separation of natural substances will be determined. "*In vitro*" testing of biological activities of extracts from natural materials will be carried out. The characterization and identification of extracted components with various analytical techniques will follow. The spectrophotometric and chromatographic methods will be used for the quantification and qualification of compounds. Isolated bioactive substances will be formulated with different types of carriers to obtain composite materials.



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HR EXCELLENCE IN RESEARCH

#### Obrazec – kratek opis programa usposabljanja

The advantages of such composites are greater stability and controlled drug release, and the corresponding size and size distribution of particles. Various high pressure techniques such as, for example, PGSS<sup>TM</sup> micronization and impregnation of biodegradable polymers and aerogels will be inquired.