Summary of the doctoral dissertation:

„The analysis of properties of activated carbons produced from arboreal fungus „ *Trametes gibbosa*"and common fern„ *Polypodium vulgare*" with special consideration of CO_2 adsorption capacity".

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Greenhouse gases are components of the atmosphere that are able to retain solar energy within the Earth's atmosphere and contribute to global warming. These include, above all, water vapor, carbon dioxide, nitrous oxide, methane, freons, ozone. Worldwide, the aim is to reduce the greenhouse effect, primarily by reducing CO_2 emissions. Current methods of capturing this gas have a number of disadvantages, which is why looking for cheap adsorbents that will be characterized by high adsorptive capacity, selectivity, chemical stability and the possibility of reusable.

The main goal of the doctoral thesis was to obtain activated carbons from biomass: arboreal fungi (*latin: Trametes gibbosa*) and common ferns (*latin: Polipodium vulgare*) characterized by high CO_2 adsorption. The possibility of producing activated carbons from biomass as a cheap and available raw material is intensively studied. However, it should be emphasized, that the use of arboreal fungi or common ferns as a precursor for the production of activated carbons has not been described before. A synthesis method was developed and the physicochemical properties of these materials were tested. It has been found that by modifying the synthesis conditions such as the temperature of carbonization, the flow and type of gas and the mass ratio of KOH to the precursor, it is possible to freely control properties and adapt them to needs. In order to characterize the obtained activated carbons, the following techniques were used: N_2 adsorption at 77 K, CO_2 adsorption at 273 K, X-ray diffractometry, Raman spectroscopy, X-ray fluorescence spectroscopy, scanning electron microscopy. Investigations of CO_2 adsorption at 273 and 298 K and adsorption of N_2 at 298 K up to 1 bar for all activated carbons were carried out.

The best adsorbents were selected from the carbons obtained from arboreal fungi and common ferns, and were tested for adsorption of CO_2up to 30 bar at 273 - 353 K. The experimental values of the CO_2 adsorption isotherms were analyzed using the isotherms equations: Langmuir, Freundlich, Sips, Toth, UNILAN, Radke-Prausnitz, Fritz-Schlunder. Isotherms parameters were determined using non-linear regression analysis. The best fit for all activated carbons at all temperatures was guaranteed by the Sips equation.

Activated carbon obtained from common fern at 800°C, with a ratio of KOH to the precursor equal to 1 and a nitrogen flow of 15 dm^3/h, was characterized by the highest CO_2 adsorption. At 298 K, under pressure of 1 bar, the adsorption of CO_2 was 5.67 mmol/g, and the value of the selectivity ratio to nitrogen equaled 23. The selectivity calculated on the basis of the theory of the ideal adsorbed solution equaled 59.5. The values are very high, which makes this material a promising CO_2 sorbent. It has been shown that it fulfills most of the requirements for the ideal CO_2 sorbent.

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