

PhD thesis abstract

Oxidation of alpha-pinene over heterogeneous catalysts**mgr inż. Jadwiga Grzeszczak****Supervisor:** prof. dr hab. inż. Agnieszka Wróblewska

Organic compounds of natural origin, including terpenes, are currently of interest to many researchers around the world. These compounds are characterized by their high availability, and the possibility of using them as a natural raw material for the synthesis of valuable compounds for the cosmetic industry and for medicine is very beneficial from an ecological and economic point of view, and represents a new approach to their management. One of the renewable and readily available raw materials of natural origin is alpha-pinene (α -pinene), a saturated bicyclic terpene hydrocarbon. A valuable source of this hydrocarbon is turpentine, which is a waste product from the paper industry. A natural and renewable source of α -pinene are also essential oils extracted from various plants, such as pine, rosemary, chamomile or orange. In order to obtain high-value products, terpenes undergo various chemical transformations, including an oxidation reaction, which takes place in the presence of a suitably selected heterogeneous catalyst. The main oxygen derivatives of alpha-pinene, such as alpha-pinene oxide, verbenol and verbenone, are widely used in the food, cosmetic and perfume industries – these compounds are mainly used as ingredients with flavor and fragrance properties, which are added to food, beverages, cosmetics and perfumes. Alpha-pinene oxygen derivatives have also found valuable applications in medicine.

This dissertation presents the studies on the oxidation of alpha-pinene over selected heterogeneous catalysts. Within the scope of the dissertation, the following porous materials were used as the catalysts for the oxidation of alpha-pinene: synthetic zeolite catalysts TS-1 with different titanium contents, synthetic catalysts ZSM-5 with different aluminum contents, carbon catalysts obtained from pine cones, and natural clinoptilolites with different particle sizes. The oxidation of alpha-pinene over heterogeneous catalysts was carried out without a solvent, and the molecular oxygen was used as an oxidant. In this work, the physicochemical properties of the above-mentioned heterogeneous catalysts were described by means of appropriately selected instrumental methods, their catalytic activity in the oxidation of alpha-pinene was studied, and the most favorable parameters for carrying out this process, such as temperature, amount of catalyst and reaction time, were determined. In the final stage of the dissertation, studies were conducted on the antioxidant activity of ethanol extracts obtained from plants containing alpha-pinene by DPPH and ABTS methods, and cosmetic emulsions were prepared with these extracts. It was shown that these emulsions are stable cosmetic products with high antioxidant potential.

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