Isomerization of monoterpenes and monoterpene epoxides over nanostructured catalysts

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Monoterpenes are hydrocarbons that can be extracted from biomass and residues; for example, from pine trees can be extracted monoterpenes such as α-pinene, β-pinene while from orange peels, R-(+)-limonene can be obtained in considerable yields (up to 95% wt). Transformation of these compounds using heterogeneous nanostructured compounds gives high-added value chemicals of interest in fine chemistry industry. In this way, several reactions have been tested for further synthesis of compounds with potential pharmaceutical applications; however, generally, the reactions are not selective. In this research, we applied the isomerization of monoterpene and monoterpene epoxides (obtained as a product of the epoxidation of monoterpene) using different nanosheets based on titanates like materials and also a series of Fe supported on mesoporous silicon oxide catalysts (e.g.: MCM-41 and SBA-15) for the selective synthesis of derived alkenes and aldehydes. It seems that exceptional textural properties, acidity (type and strength) and geometrical shape play an important role for the highly selective synthesis of camphene from isomerization of both α- and β-pinene (**Figure 1a**) and aldehydes from monoterpenes epoxides (**Figure 1b**). Effect of typical operational conditions (temperature, catalysts amount and time) were also evaluated. Finally, heterogeneous catalysts were recovered and used for several cycles showing their robustness in industrial applications. Computational simulations were also carried out for further understanding of the role of the active sites and the reaction pathway for the proposed transformations.

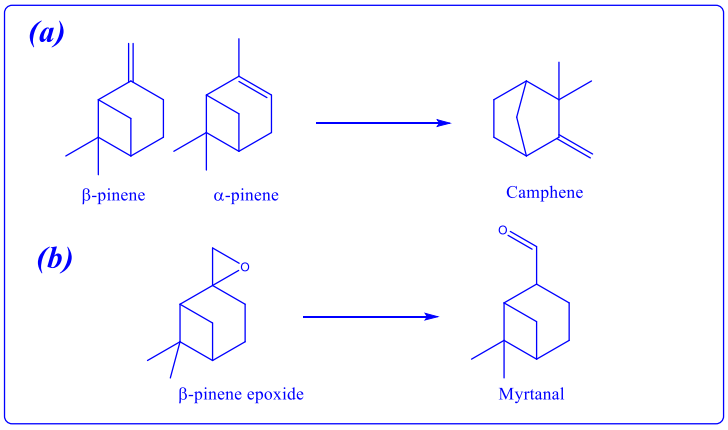

Figure 1: Isomerization of α- and β-pinene (a), and β-pinene epoxide (b)

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