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Intensification of oxidation and epoxidation reactions - microwave irradiation vs. conventional heating

Dariusz Bogdal

Cracow University of Technology, Poland

A survey on the oxidation reactions that we have performed under microwave irradiation for almost last twenty years is presented, and the examples of reactions in homogenous, heterogeneous as well as biphasic systems are shown. First, for the reactions in biphasic systems, we presented oxidation reactions of primary and secondary alcohol as well as the epoxidation of simple alkenes. Then, the protocols for halogenation of aromatic compounds in the presence of hydrogen peroxide is described, in which water was the only expected side product of hydrogen peroxide reactions. In turn, the heterogeneous reactions were carried out for catalysts supported on silica matrix, and, besides oxidation reactions of alcohols, aldehydes

and alkenes, the oxidations of some aromatics and activated methylene groups were performed. The reactions were run in the presence of tungstoboric acid supported on SiO₂ in the presence of hydrogen peroxide as well as MagtrieveTM (CrO₂) as an oxidant and support, in which reverse temperature gradient during the reactions was clearly demonstrated. Finally, homogeneous oxidation reactions were carried out in the presence of hydrogen peroxide and zinc polyoxymetales (POMZn) which were irradiated under pressurized conditions. POMZn exhibited excellent yields and possibility of recycling without loss of catalytic activity.

pcbogdal@cyf-kr.edu.pl