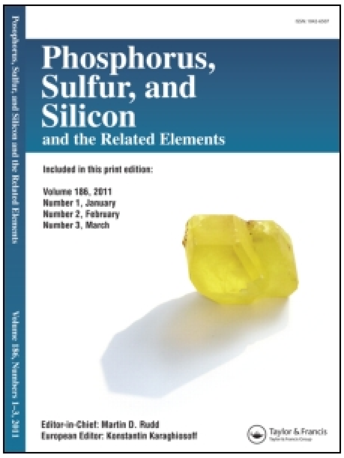

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The Catalytic Activities of Poly Acid/Apatites in the Epoxidation Using Urea-Hydrogen Peroxide

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THE CATALYTIC ACTIVITIES OF POLY ACID/APATITES IN THE EPOXIDATION USING UREA-HYDROGEN PEROXIDE

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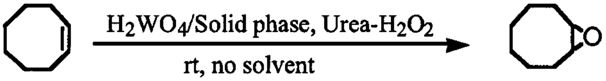
Apatites, $Ca_{10}(PO_4)_6X_2$, which form the mineral component of bones and teeth, are handled as a harmless solid to environment. We have found that tungstic acid catalyst dispersed on apatite solid phase (H_2WO_4/apatite) is effective as the environmentally benign solid catalyst for the epoxidaton of alkenes and allylic alcohols with solid urea-hydrogen peroxide complex (urea-H_2O_2).[1]



For comparing the utility of the solid phase, silica gel, calcium fluoride, tricalcium phosphate (α-TCP) and apatites (HAp, FAp) were used in the epoxidation reaction of cyclooctene with H_2WO_4 catalyst and urea-H_2O_2. The order of catalytic activities of H_2WO_4/solid was FAp $\sim$HAp $>$ CaF_2 $\sim$ silica gel $>$ α-TCP. Under solvent-free conditions, in general, the surface area of solid phase is the most important factor for accelerating the reaction. However, the activities order was inconsistent with the order of the solid surface area, silica gel $\gg$ HAp $\sim$ FAp $\sim$ CaF_2 $>$ α-TCP. Apatite having low surface area was the most effective as the solid disperse phase. Because of cation and anion-exchange ability and affinity for organic compound, apatite may moderately interact with both the inorganic catalyst and alkenes to assist the tungstic acid-catalyzed epoxidation reactions.

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[1] J. Ichihara, *Tetrahedron Lett.*, **42,** 695–697 (2001).