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Catalytic Epoxidation Activity of Keplerate Polyoxomolybdate Nanoball toward Aqueous Suspension of Olefins
under Mild Aerobic Conditions

Aerobic Epoxidation with a Polyoxomolybdate Nanoball

Significance: The aerobic epoxidation of olefins in aqueous solution takes place with the Keplerate-type polyoxomolybdate Mo$_{132}$ Catalyst 1 under oxygen to give the corresponding products 2a–h in up to 97% yield. In contrast, MoO$_3$, (NH$_4$)$_6$Mo$_7$O$_{24}$, and Na$_2$MoO$_4$ showed no catalytic activity under similar conditions.

Comment: The Mo$_{132}$ nanoball decomposed at pH >8. The decomposed material had no catalytic activity for the epoxidation. The Mo$_{132}$ nanoball catalyst 1 was readily recovered as an aqueous solution and reused nine times without significant loss of its catalytic activity. The solid Mo$_{132}$ catalyst was also readily recovered by removal of water.

Selected results:

- 2a: 2 h, 96% yield
- 2b: 3 h, 92% yield
- 2c: 2 h, 95% yield
- 2d: 4 h, 94% yield
- 2e: 4 h, 89% yield
- 2f: 4 h, 90% yield
- 2g: 5 h, 96% yield
- 2h: 5 h, 97% yield

Mo$_{132}$ nanoball = [(NH$_4$)$_4$Mo$_{132}$V$_{72}$O$_{24}$O$_{36}$]$_{12}$

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