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Structural features of $AgCaCdMg_2(PO4)_3$ and $AgCd_2Mg_2(PO_4)_3$, two new compounds with the alluaudite-type structure, and their catalytic activity in butan-2-ol conversion

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Abstract

$AgCaCdMg_2(PO_4)_3$ and $AgCd_2Mg_2(PO_4)_3$, two new compounds with the alluaudite-type structure, were synthesized by a solid state reaction in air at 750°C. The X-ray powder diffraction pattern of $AgCaCdMg_2(PO_4)_3$ indicates the presence of small amounts of $(Ca,Mg)_3(PO_4)_2$ with the whitlockite structure, as impurity, whereas $AgCd_2Mg_2(PO_4)_3$ is constituted by pure alluaudite.
The Rietveld refinement of the X-ray powder diffraction pattern of $AgCd_2Mg_2(PO_4)_3$ indicates an ordered cationic distribution with Ag on *A*(2)', Cd on *A*(1) and *M*(1), and Mg on *M*(2). The catalytic properties of the $AgCd_2Mg_2(PO_4)_3$ compounds has been measured in reaction of butan-2-ol dehydrogenation. In absence of oxygen, the sample exhibits poor dehydrogenation activity. The sample displayed no dehydration activity. Introduction of oxygen in feed change totally the catalytic behavior of the catalyst. The production of methyl ethyl ketone increases with time on stream and the reaction temperature.