A new set of $K_3Fe_3(PO_4)_4.yH_2O$ ($0 \leq y \leq 1$) layered phases obtained by topotactic reactions

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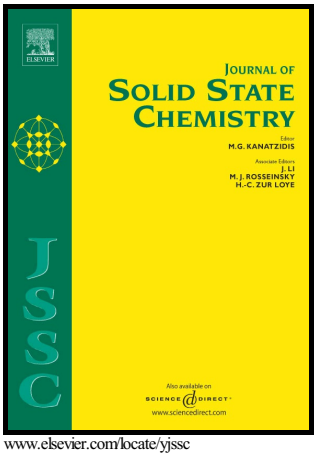

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A new set of $K_3Fe_3(PO_4)_4 \cdot yH_2O$ ($0 \leq y \leq 1$) layered phases obtained by topotactic reactions.

Khiem Trad [a,b], Alain Wattiaux [a], Mongi Ben Amara [b], Claude Delmas [a] and Dany Carlier [a*]

[a] CNRS, Univ. Bordeaux, Bordeaux INP, ICMCB UMR 5026, F-33600 Pessac, France

[b] UR : Matériaux Inorganiques, Faculté des Sciences, Université de Monastir, avenue de l'environnement, 5019, Monastir, Tunisia

Abstract

$K_3Fe_3(PO_4)_4.H_2O$ powder was synthesized by Na^+/K^+ exchange reaction from $Na_3Fe_3(PO_4)_4$ in aqueous medium. The replacement of the sodium cations by the potassium larger ones and water molecules causes a structural distortion leading to P2/n monoclinic $K_3Fe_3(PO_4)_4.H_2O$. This new layered phase was characterized by XRD, Mössbauer spectroscopy and magnetic measurements. The study of its thermal stability reveals that other new layered $K_3Fe_3(PO_4)_4.yH_2O$ with ($0 \leq y \leq 1$) phases can be stabilized up to 600°C and finally at higher temperature a new $K_3Fe_3(PO_4)_4$ polymorph with a different structural type is irreversibility formed.

Graphical abstract

New layered $K_3Fe_3(PO_4)_4.yH_2O$ phases prepared by ion-exchange from $Na_3Fe_3(PO_4)_4$