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Hydrothermal synthesis and structure of framework cobalt phosphates

AMITAVA CHOUDHURY [a,b], SRINIVASAN NATARAJAN [a] and C N R RAO [a,b]

[a]Chemistry and Physics of Materials Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur PO, Bangalore 560 064, India

[b]Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore 560 012, India

Open-framework phosphates investigated in the last few years, specially those of transition metals, are of particular interest because of their potential applications in catalysis, sorption and separation techniques. Amongst the transition metals, cobalt phosphate occupies a prime position because of its interesting magnetic properties. The compound $[C_2N_2H_{10}]_2[Co_4(PO_4)_4]^+H_2O$ (**I**), has a structure constructed from alternating CoO_4 and PO_4 tetrahedra. The connectivity leads to the formation of 8-membered channels in all the crystallographic directions resembling the aluminosilicate zeolite, merlinoite. The compound is unique in the sense that it is the first pure transition metal phosphate which has zeolitic structure. The compound $[Co_{3\cdot5}(PO_4)_3][C_2N_2H_{10}]$ (**II**), has several noteworthy features. The structure is constructed using CoO_4, CoO_5, CoO_6 and PO_4 polyhedra. It shows an unusual structural transformation on cooling. A sheet-like Co-O-Co connectivity at room temperature extends in three dimensions at 140 K as is observed by single crystal structure determination at both room temperature and at 140 K. Magnetic studies reveal that the compound shows ferromagnetic interactions at low temperature.