

Synthesis of a 4-membered ring zinc phosphate monomer and its condensation self-assembly into an open-framework structure

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In recent years there has been a tremendous surge in the synthesis of open-framework metal phosphates, with the objective of rendering them porous for potential application in catalysis and sorption processes. These materials are generally prepared hydrothermally in the presence of organic amines. One of the crucial aspects of these materials that needs to be understood is the pathway which leads to the evolution of these hierarchical structures with varying degrees of complexity. In the case of aluminophosphates, it has been proposed that a linear chain precursor transforms to a ladder-type structure, followed by layer and 3-dimensional structures. The chain and ladder structures themselves contain 4-membered metal phosphate rings which clearly constitute the fundamental building unit of these open-framework structures. Our objective was to see if we could isolate this monomeric 4-membered ring basic building unit and examine its transformation, if any, to open-framework structures. Our studies in this direction have resulted in isolation of a monomeric 4-membered ring zinc phosphate, which on further heating at 50°C transforms to a layered open-framework structure. The isolation of this monomeric unit is of fundamental significance.