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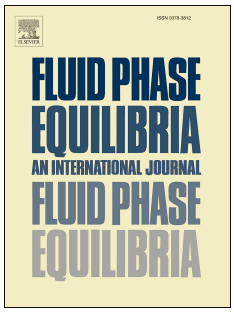

Thermodynamic equilibrium in the system H_2O+P_2O_5+$CaCO_3$ at 25 and 70 °C: Application for synthesis of calcium phosphate products based on calcium carbonate decomposition

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ACCEPTED MANUSCRIPT

Title:

Thermodynamic equilibrium in the system $H_2O+P_2O_5+CaCO_3$ at 25 and 70°C: Application for synthesis of Calcium phosphate products based on calcium carbonate decomposition.

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Abstract:

The solid-liquid equilibrium of the ternary system of water-phosphorus pentoxide-calcium carbonate was studied using a synthesis method based on the measurement of the solution conductivity under atmospheric air pressure. Two isotherms were established at 25 °C and 70 °C with control of calcium carbonate decomposition in contact with aqueous solutions of P_2O_5. A phase sequences study was carried out at 25 °C in the isoplethic section of $CaCO_3$-H_2O-P_2O_5 system. The solid phases observed at these temperatures are: dehydrated calcium hydrogen phosphate $CaHPO_4.2H_2O$, Hydroxyapatite $Ca_{10}(PO_4)_6(OH)_2$, anhydrous calcium hydrogen phosphate $CaHPO_4$ and calcium dihydrogen phosphate monohydrate $Ca(H_2PO_4)_2.H_2O$. All stable solids are characterized by X-ray diffraction and the Schreinemaker method.

Keywords:

Phase diagram, Calcium phosphate products, Schreinemaker's method, Isotherm 25 and 70°C, Conductimetric method.

1. Introduction :

Calcium phosphates compounds of high purity are produced for different uses including pharmaceutical and nutritional applications. There are five distinct groups of calcium phosphates: $Ca(H_2PO_4)_2$ anhydrous monocalcium phosphate (MCPa), $Ca(H2PO_4)_2{\cdot}H_2O$ monocalcium phosphate monohydrate (MCPM), $CaHPO_4{\cdot}2H_2O$ dicalciums dehydrate DCPD, $CaHPO_4$ anhydrous salt (DCPa) and $Ca_5(OH)(PO_4)_3$ hydroxyapatite (HAP). In connection with the experimental preparation of calcium phosphates compounds, many methods have been reported for their synthesis. For example, HAP including solid-state reaction, sol–gel, precipitation methods and electrophoretic deposition methods [1, 2]. In addition to that, hydroxyapatite can be used in different areas, according to Yapıncak Göncü et al [3] HAP is widely used in orthopedic implants for the repair and reconstruction of bone tissue defects due to their chemical composition and crystal structure compared to those inorganic parts of the bones and teeth. For R. F. Bonan et al [4] one way to improve these properties is to combine HAP with other materials such as zirconia, alumina, bioglasses or titanium in order to combine the desirable properties of

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