Statics and kinetics of dissolution of tricalcium phosphate in a membrane mini-reactor (MR) in the presence of humic acids

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The problem of increasing the efficiency of mineral phosphate fertilizers is largely determined by the physicochemical processes of the interaction of molecular-soluble forms of their dissolution products with inorganic constituents of soils. To study the processes

Fig. 1. Kinetics of dissolution of TCP and HA components from MR into a 0.1 M NaNO₃, 220C solution. Circles - TCP and HA - in one MR; triangles - TCP and HA - in different MRs.

with the participation of soluble phosphates and oxide phases, we experimentally analyzed the heterogeneous equilibria and the kinetics of dissolution of the most sparingly soluble calcium phosphate - β -modification of tricalcium phosphate (TCP) in the background electrolyte, depending on the pH of the solution and the concentration of humic acids in it. The theoretical analysis of equilibria was carried out using the HSC Chemistry and MathCad programs. Experimental studies were carried out by the limited volume method using the membrane mini-reactor technique [1]. This made it possible to observe the mass transfer of Ca²⁺, PO₄²⁻, OH⁻ ions into an external electrolyte solution (0.1 M NaNO₃) from

the solid phase of TCP, placed inside one or two different mini-reactors (MR), the walls of which were a semipermeable membrane made of a lavsan track membrane with pore size

0.1 or 1.0 μ m, or It was found that the joint presence of TCP and HA in the volume of one MR reduces the rate of dissolution of phosphate, but does not affect the rate of dissolution of solid HA, Fig.1. The reason for this is the large difference in the solubility of HA and TCP. The reason for this is the large difference in the solubility of HA and TCP. If TCP and HA are in separate MRs, the accumulation of HA in solution decreases due to dissolution as well as the rate of dissolution of TCP. The presence of the PO₄-ion in the solution reduces the rate of dissolution of solid HA. The report discusses the problems of controlling the solubility of phosphates in soil, of using them as sorbents for removing strontium radionuclides using the MR membrane technique.

References

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