

Studies Regarding the Obtaining of PK Liquid Fertilizers with Zinc Microelement

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INTRODUCTION

Liquid fertilizers with microelements have a special effect on plants, especially when it is applied foliar (Iovi and Iovi 2004, Boiko et al. 1998).

Zinc is an important microelement for plant development as constituent and enzyme activator with role in respiration and participant in oxydo-reduction processes. The required Zn-dose is 0.5-2 kg ha⁻¹ (Bozadziev et al. 2001, Xie and Mackenzie 2005).

METHODS

In this paper we studied the composition of a liquid fertilizer with PK and Zn from ZnSO₄ and K₄P₂O₇ solutions under different conditions. We examined the Zn separation degree versus different molar ratios of Zn²⁺ : P₂O₇⁴⁻, concentrations and temperatures.

Various molar ratios (Zn²⁺ : P₂O₇⁴⁻ = 0.5 : 1, 1 : 1, 1.5 : 1, 2 : 1), molar concentrations (0.075, 0.1, 0.15, 0.2 M) and temperatures (25, 50, 75, 100°C) were tested. The Zn concentration of solutions was measured by Atomic Absorption Spectrophotometry (AAS) (Varian SpectrAA 110).

RESULTS AND DISCUSSION

a) Zinc Separation Degrees versus Molar Ratios Zn²⁺ : P₂O₇⁴⁻.

The experimental data regarding Zn separation degrees versus molar Zn²⁺ : P₂O₇⁴⁻ ratios are presented in Fig. 1.

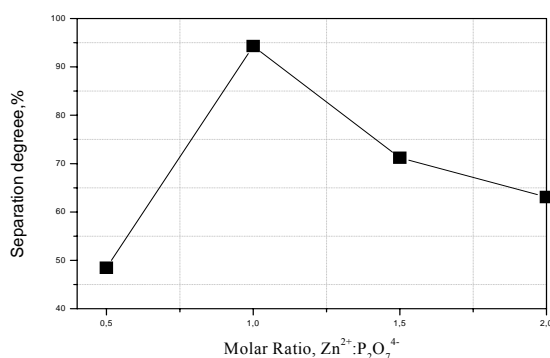


Fig. 1. Zinc separation degrees versus molar ratios Zn²⁺ : P₂O₇⁴⁻ at 0.1M and 25°C.

Zinc separation degrees increased until the molar ratio of Zn²⁺ : P₂O₇⁴⁻ reached 1 : 1 due to the Zn excess in solution. At ratios higher than 1.5 : 1, the separation degree decreased due to the formation of soluble compounds.

b) Zinc Separation Degrees versus Concentrations

The experimental data regarding Zn separation degrees versus concentrations at a molar Zn²⁺ : P₂O₇⁴⁻ ratio of 1 : 1 at 25°C are presented in Fig. 2.

The Zn separation degree increased with increasing concentrations. At concentrations higher than 0.1 M, the separation degree seemed to become a constant value (~98%).

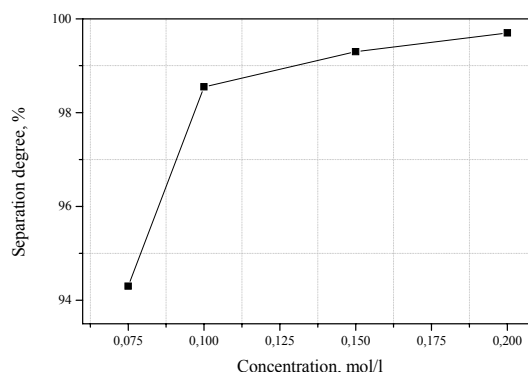


Fig. 2. Zinc separation degrees versus concentrations at a molar $Zn^{2+} : P_2O_7^{4-}$ ratio of 1 : 1 and 25°C.

c) Zinc Separation Degrees versus Temperature

The experimental data regarding Zn separation degrees versus temperature at a molar $Zn^{2+} : P_2O_7^{4-}$ ratio of 1 : 1 and a 0.15 M concentration revealed that the separation degree is not influenced by increasing temperatures, reaching a separation degree of 99.9%.

d) Studies about the Chemical Composition

Table 1 presents the chemical composition of the obtained product.

Table 1. The chemical composition of the obtained product.

Chemical composition, %			Molar ratio
Zn	K	P_2O_5	Zn:K: P_2O_5
14,1	7,8	36	1 : 1 : 1

Based on the experimental data regarding the chemical composition of the obtained product and based on results of Iovi and Iovi (2004), it can be concluded that the obtained doubled $P_2O_7^{4-}$ of Zn and K corresponds to the chemical formula $ZnKHP_2O_7 \cdot 10H_2O$.

CONCLUSIONS

To obtain liquid fertilizers with PK and Zn, the following work parameters were established: molar ratio $Zn^{2+} : P_2O_7^{4-} = 1 : 1$, concentration of 0.1 M and a temperature of 25°C.

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