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Adsorption investigations of the mixed synthesized zeolite type a with humic acid by UV-Vis and GC-MS

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ABSTRACT

The purpose of this study is to access the efficiency of removal of pesticide Mancozeb (Dithiocarbamates family) from soil of Tobacco fields by means of different sorbents (synthesized zeolite type A, Humic Acid (HA) extracted from Noshahr jungle soil and mixture of them). Freundlich isotherms were used to select the best sorbent and in different values of sorbents, pH and concentrations were optimized.

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KEYWORDS

Mancozeb residue;
Adsorption;
Tobacco fields;
Humic acid;
Zeolite NaA.

INTRODUCTION

Pesticides have been detected in all kinds of circulating nature. Many countries have undertaken special programs to reduce the influence of pesticides^[1]. As we know zeolites have high sorption capacity, so we examined the mixed synthesized zeolite type A with Humic Acid and adsorption investigations were carried out to obtain better result for removal pesticide Mancozeb.

EXPERIMENTAL

Zeolite NaA was synthesized from sodium aluminosilicate solutions by hydrothermal method^[2]. For extracting HA from soil, samples are collected from Noshahr jungle soil, Iran. The HA extracted by shaking the samples with NaOH for 24 h and then filter. The supernatant was acidified with HCl. The obtained brownish-black participate was HA^[3].

At the other hand 0.1 g of each sorbents were

added into different concentration of Mancozeb and shaken for 1h. According to Coresta method N^o1^[4], the concentration of CS₂ which is formed from heating Mancozeb in presence of SnCl₂ is measured by spectrophotometry at $\lambda_{max} = 302$ in potassium methanolic solution and GC-MS.

The sorption characteristics of Mancozeb with different sorbents were studied in different values of sorbents, pH and concentrations.

RESULT AND DISCUSSION

The premixed molar oxide ratio of this zeolite was 2 SiO₂: Al₂O₃: 4 Na₂O: 120 H₂O. The comparison of XRD data in TABLE 1 is shown the synthesized zeolite is NaA type.

The characteristics of soil of Noshahr jungle (in the north of Iran) which was used for extracting HA were: OC: Organic Carbon (13.7) %, N (2.06) %, P (15) ppm, K (532.6) ppm, (294.7) ppm, Cl⁻ (1.7) ppm, C/N: Carbon/Nitrogen (6.65), pH (7.20), EC: Electric

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TABLE 1: XRD data (2θ) of reference LTA zeolite^[5] and synthesized zeolite (SZ)

Ref	7 ⁰	12.5 ⁰	16 ⁰	21.5 ⁰	24 ⁰	26 ⁰	27 ⁰	30 ⁰	31 ⁰	32.5 ⁰
SZ	7.2 ⁰	12.5 ⁰	16.1 ⁰	21.7 ⁰	24 ⁰	26.1 ⁰	27.1 ⁰	29.9 ⁰	30.8 ⁰	32.5 ⁰

TABLE 2: The coefficients of Freundlich adsorption isotherms of Mancozeb on sorbents ($1/n$ and k_f), values of R are for correlation coefficients

Sorbents	$1/n$	k_f	R
Mixture of sorbents	0.346	40.49	0.9914
Zeolite NaA	0.283	15.64	0.9851
Humic acid	0.270	8.09	0.9766

TABLE 3: Values of peak area which were obtained by GC-MS. (PS= Pesticide solution, H= HA, Z=zeolite, M= mixture of sorbents)

PS	PS+H	PS+Z	PS+M
36408212	108754395	10415118	7395311

Conductivity (1.10) S. The obtained recovery factor in extraction was 6.3 %.

The adsorption investigations were carried out in different concentrations in the ranges of (0.4-1.6) (mg/l). A lower adsorption at higher pH values in 1.6 mg/l of Mancozeb solution with 0.1 g sorbents may be due to the abundance of OH⁻ ions and because of ionic repulsion between the negatively charged surface and anionic pesticide molecules. It was found that with increasing values of sorbents up to 0.75 g (zeolite of type A) and 2 g (HA) in 1.6 mg/l of Mancozeb at pH=5 the rate of removal of pesticide Mancozeb increases. Freundlich adsorption coefficients ($1/n$ and k_f) and peak area of sorbents obtained from GC-MS were shown in TABLES 2 and 3.

CONCLUSION

On the basis of the results it was concluded that the efficient of sorbents in removal of pesticide are in order: Mixture of sorbents > synthesized zeolite type A > Humic Acid extracted from Noshahr jungle soil.

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