

1. Abstract (Tóm tắt): 800-1000 characters.

A series of novel 2,4-disubstituted 1,3-thiazole derivatives having a modified phenothiazine moiety (4) were synthesized. All synthesized compounds (4), (5a-i) were screened for their cytotoxicity against cancer cell line MCF-7. Most of them (5a-i) were less cytotoxic or had no activity against cancer cell line MCF-7. The IC_{50} value of compound (4) was **33.84 μ M**. The compounds (5a-i) were also evaluated for anti-microbial activities, but no significant activity was observed.

2. Introduction (Giới thiệu)

Thiazole derivatives are reported to possess numerous biological activities such as anti-bacterial, anti-hypertensive, anti-inflammatory, anti-schizophrenia, anti-HIV, anti-allergic, anti-analgesic and anti-tumor activities, fibrinogen receptor antagonist activity with antithrombotic activity, as bacterial DNA gyrase B inhibitor activity¹. Thiazole ring also extend its applications in other fields, such as polymers²

3. Methods and Materials (Vật liệu và phương pháp)

The obtained samples were characterized by TEM, SEM, XRD, FTIR and BET methods.

To study the mechanisms of sorption of Pb^{2+} , Cd^{2+} ions on CHA, after the sorption experiments, the remaining solid phase of the sample was filtered, dried and qualitatively characterized by the methods of XRD analysis and FTIR spectroscopy.

4. (Results) Kết quả

The results of Transmission electron microscopy (TEM) examination of the samples in hydrogel form show that CHA particles appear as rod-like crystals with a width of 10-20 nm and a length of 75-150 nm (Figure 1.a). The dried white powders of CHAP are particles of 1-10 microns in size, which are insoluble in alkalis and partially stable in weakly acidic medium (Figure 1.b). The specific surface area of the sample C1.50 is about twice as high as that of the sample C1.67 (Table 1). The maximum sorption capacities of Pb^{2+} and Cd^{2+} on d-CHA are equal to 1724 mg/g (C1.50, pH = 5.5) and 193.2 mg/g (C1.62, pH = 7.4), respectively (Table 2). Those sorption capacities on synthesized d-CHA are many times higher than that on unmodified hydroxyapatite, whose sorption capacities of Pb^{2+} , Cd^{2+} are 320 mg Pb^{2+} /g [8] and 66.7 mg Cd^{2+} /g [9].

The sorption process on d-CHA is accompanied by a decrease in amount of heavy metal ions and an increase in amount of Ca^{2+} ions (Figure 3).

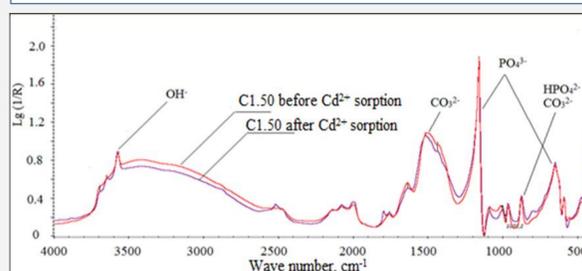


Figure 2. Absorption FTIR-spectrum of the samples C1.50 before and after Cd^{2+} sorption

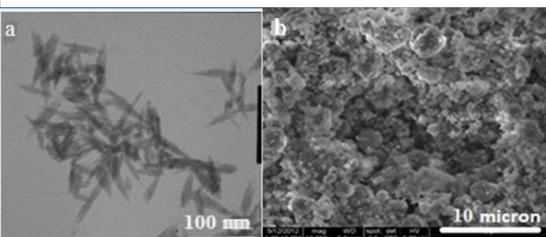


Figure 1. TEM and SEM images of d-CHA.

Table 1. Data on sorption of Pb^{2+} ions on CHA samples.

Sample	Specific surface area, m^2/g	Pore volume, cm^3/g	Pore size, A°
C1.50	184.3	0.41	87
C1.56	174.0	0.45	104
C1.62	164.0	0.44	108
C1.67	91.0	0.50	218

5. (Thảo luận) Discussion

It was revealed that after sorption of Pb^{2+} ions on particles of carbonated hydroxyapatite, there was formation of a new crystal phase of carbonated hydroxypyromorphite, which has crystallochemical formula and structure similar to those of hydroxyapatite (space group $P6_3/m$). Meanwhile, on the solid particles after Cd^{2+} sorption was not observed appearance of a new phase.

Generally, FTIR spectrum of solid phase d-CHA before and after sorption of heavy metal ions have no significant differences (Figure 2).

From comparison of the data shown in Table 4 and Figure 6 it follows that in the sorption process of heavy metal ions on d-CHA the possible sorption mechanism should be izomorphic institution of Ca^{2+} into heavy metal ions.

6. (Kết luận) Conclusions

Nano-sized calcium-deficient carbonated hydroxyapatite was synthesized using wet method. A series of experiments were conducted to determine the sorption capacity of the material for heavy metal cations in simulated tissue± solution. The sorption process was effectively described by the Langmuir adsorption model. It was found that the synthesized carbonated hydroxyapatite is nano-sized and has an excellent sorption capacity: for Pb^{2+} ions – up to 1724 mg/g at pH = 5.5, 588 mg/g at pH = 7.4; for Cd^{2+} ions – up to 114.9 mg/g at pH = 5.5, 193.2 mg/g at pH = 7.4.

XRD, FTIR examinations of the solid substance and chemical-physical examinations of liquid phase after heavy metal ions sorption showed the sorption mechanism may be isomorphic institution.

6. Acknowledgments (Lời cảm ơn)

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Tài liệu tham khảo (References)

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