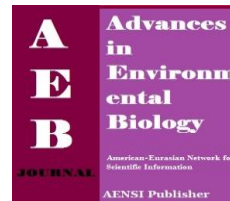




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Synthesis, characterization and properties of new nano halo aluminates

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ABSTRACT

Sodium Trichlorofluoroaluminate(III) ($\text{Na}^+[\text{AlCl}_3\text{F}]^-$) and Sodium Trichloronitratealuminate(III) ($\text{Na}^+[\text{AlCl}_3\text{NO}_3]^-$) nanopowders were synthesized by Co-precipitation method. The synthesized nano powder were characterized by X-Ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Mass spectroscopy and UV-Vis spectroscopy. The particle size estimated using Scherer's formula was found to be in the range 30-35nm for $\text{Na}^+[\text{AlCl}_3\text{F}]^-$ and range 35-40 for $\text{Na}^+[\text{AlCl}_3\text{NO}_3]^-$ synthesized by Co-precipitation method.[1-4] The morphological features as studied using SEM revealed that the nanopowders are agglomerated, crispy with porous. The SEM images of synthesized nanopowders confirm the formation of nanoparticles are agglomeration. The optical absorption spectrum showed a strong absorption band peaked at 244 nm for $\text{Na}^+[\text{AlCl}_3\text{F}]^-$ and 350nm for $\text{Na}^+[\text{AlCl}_3\text{NO}_3]^-$ nanoparticles synthesized by co-precipitation method. The mass spectroscopy showed these nanoparticles have produced. Some properties of them such as biological that contain anticancer and antibacterial of them were been studied.

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INTRODUCTION

Many methods for synthesis of metallic and ceramic nanoscales in lab and industrial scales have invented[5]. Generally we can divide the way of nanopowder producing to three main groups, synthesis of gas phase, solid phase, and liquid phase. In recent years nanopowder producing ways of liquid and gas are attended more[2]. Co-precipitation method is a good technique for producing of nanoparticles, and its wide usage is for flexibility and manage on materials that you want produce. This way is based on solution formation of first materials in suitable solvent and deposit formation after two materials mixture. This technique is so suitable, because it has the least sample pollution and its preparation has low cost. In recent years aluminium nanoparticles have attracted, because of their mixing capability in explosive and motive materials[6]. In this research, two compounds of Aluminium family with two absolute different compounds with Co-precipitation method have studied, and produced nanoparticles have searched. Anticancer and antibacterial tests showed that $\text{Na}^+[\text{AlCl}_3\text{F}]^-$ has good anticancer and antibacterial properties and $\text{Na}^+[\text{AlCl}_3\text{NO}_3]^-$ has antibacterial properties.

1. Experimental:

1.1 Synthesis:

1.1.1 Synthesis of new nano Sodium Trichlorofluoroaluminate(III) ($\text{Na}^+[\text{AlCl}_3\text{F}]^-$):

Analar grade aluminiumchlorid (AlCl_3), Sodiumfluorid (NaF) and acetonitrile were procured from Merck Company. In Co-precipitation method synthesis of $\text{Na}^+[\text{AlCl}_3\text{F}]^-$ nanoparticles, 0.01 mol AlCl_3 was dissolved in 20ml acetonitrile taken in 100ml conical flask. 0.01mol NaF was added into the flask under vigorous stirring on a magnetic stirrer. The mix solution was stirred for 3 h to transform the transparent reaction mixture into opaque white suspension gradually. Then the mixture was centrifuged for 15 min at 5000 rpm and washed three times with acetonitrile, ether and n-hexane via centrifugation to remove the residual Sodiumfluorid and the aluminiumchlorid. Finally the solid product was extracted onto a ceramic dish and dried on a sand bath.

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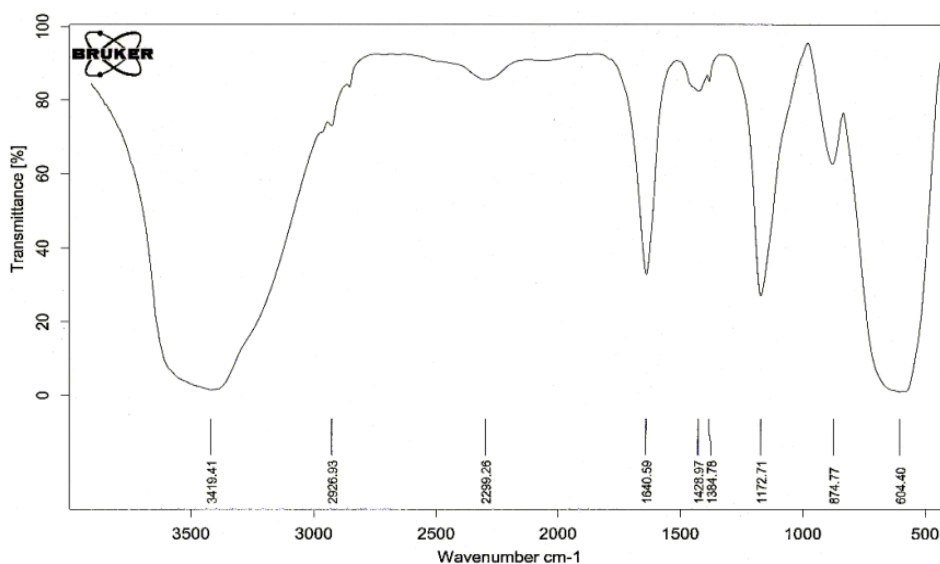
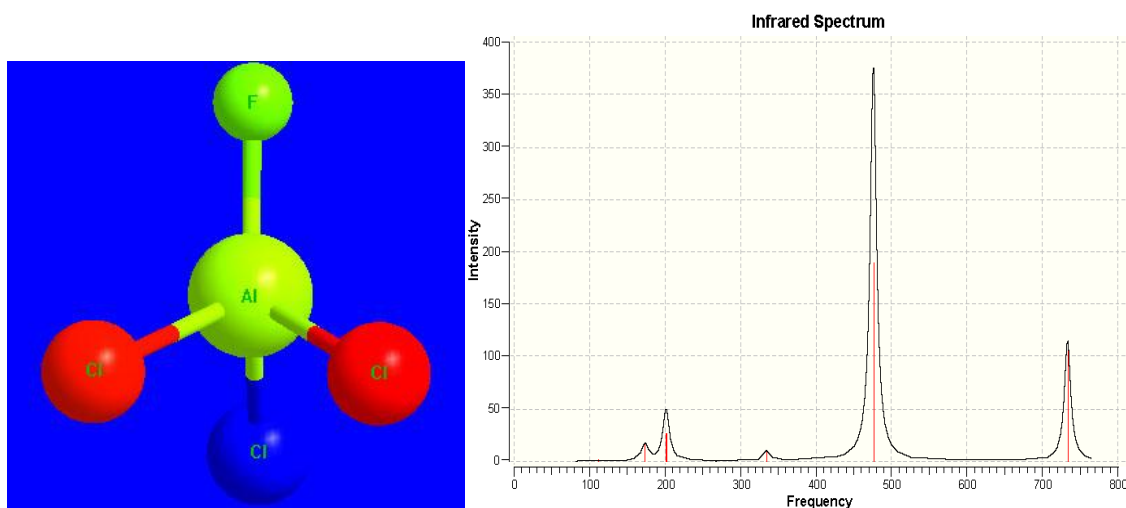
2.1.2 Synthesis of new nano Sodium Trichloronitratoaluminate(III) $\text{Na}^+[\text{AlCl}_3(\text{NO}_3)]^-$:

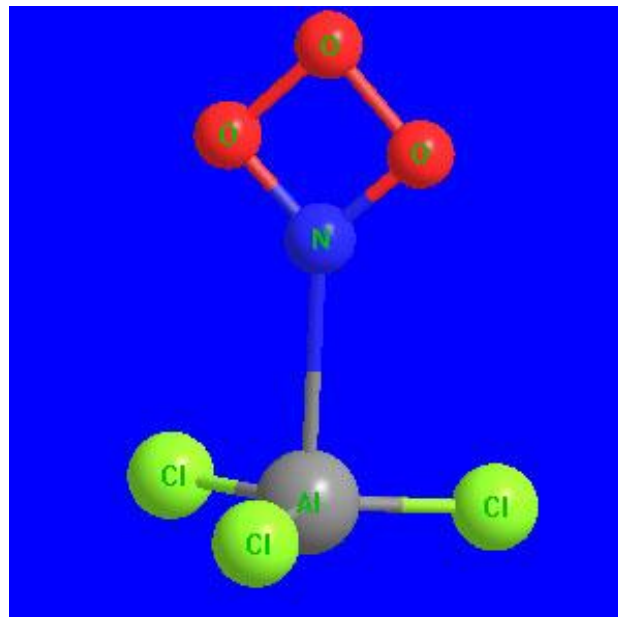
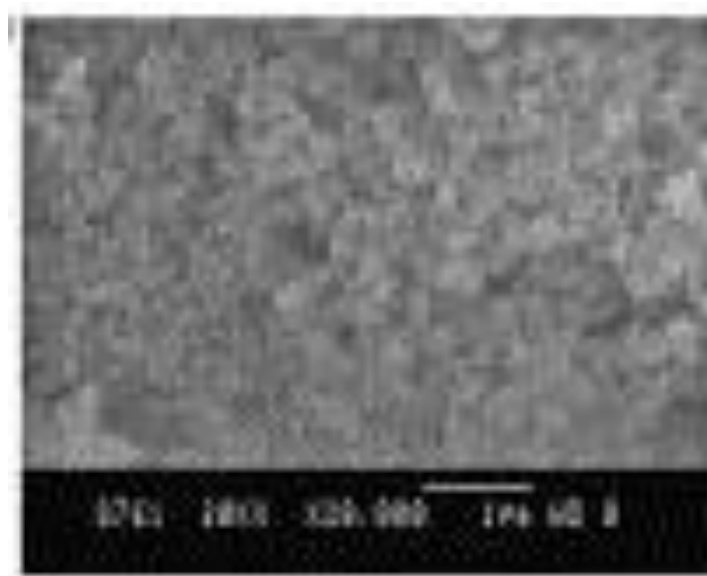
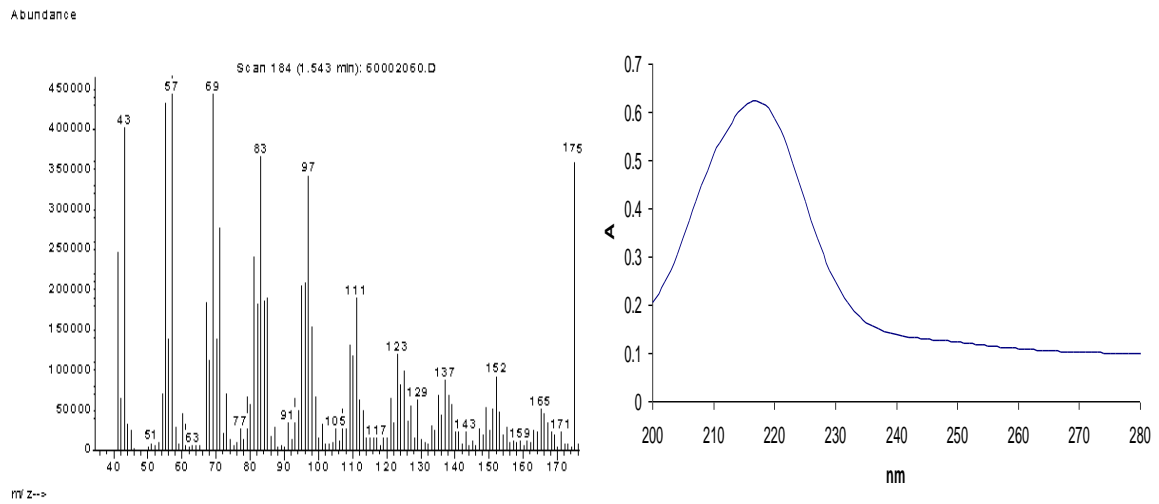
Analar grade aluminiumchlorid (AlCl_3), Sodiumnitrate (NaNO_3) and acetonitrile were procured from merk Company . In Co-precipitation method synthesis of $\text{Na}[\text{AlCl}_3\text{NO}_3]$ nanoparticles, 0.01 mol AlCl_3 was a dissolved in 20ml acetonitrile taken in 100ml conical flask. 0.01mol NaNO_3 was added into the flask under vigorous stirring on a magnetic stirrer. The mix solution was stirred for 3 h to transform the transparent reaction mixture into opaque white suspension gradually. Then the mixture was centrifuged for 15 min at 5000 rpm and washed three times with acetonitrile, ether and n-hexane via centrifugation to remove the residual Sodiumnitrate and the aluminiumchlorid. Finally the solid product was extracted onto a ceramic dish and dried on a sand bath.

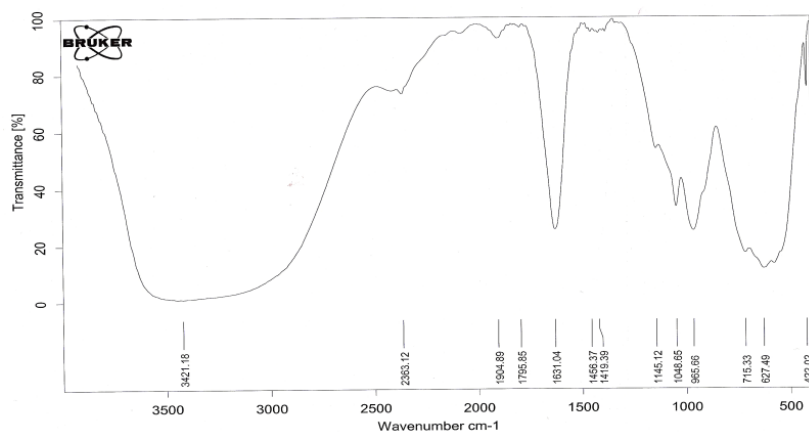
RESULTS AND DISCUSSION

In this search nanopowder of Trichlorofluoroaluminate(III) ($\text{Na}^+[\text{AlCl}_3\text{F}]^-$) and Sodium Trichloronitratoaluminate (III) $\text{Na}^+[\text{AlCl}_3(\text{NO}_3)]^-$ were synthesized by Co-precipitation method. The synthesized nanopowder was studied with different analytical methods.

The results of X-Ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Mass spectroscopy and UV-Vis spectroscopy, confirm the synthesis of nanopowders. According to the results we can understand ($\text{Na}^+[\text{AlCl}_3\text{F}]^-$) and $\text{Na}^+[\text{AlCl}_3(\text{NO}_3)]^-$ deposit which has produced with this method is a simple and economic procedure with formation and particle size control.



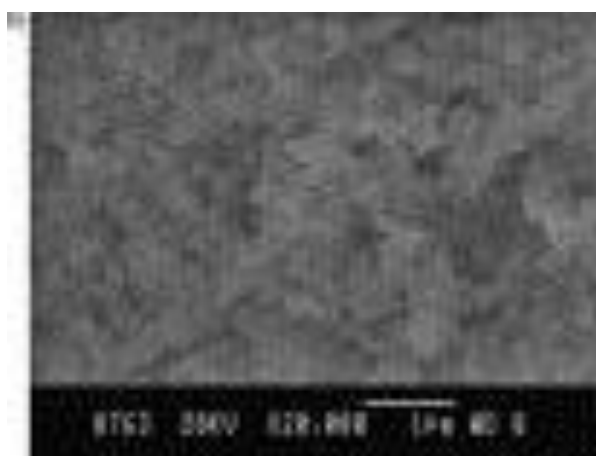
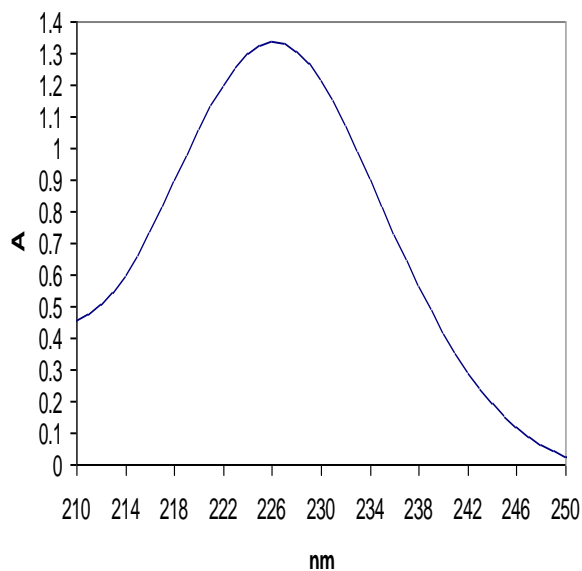
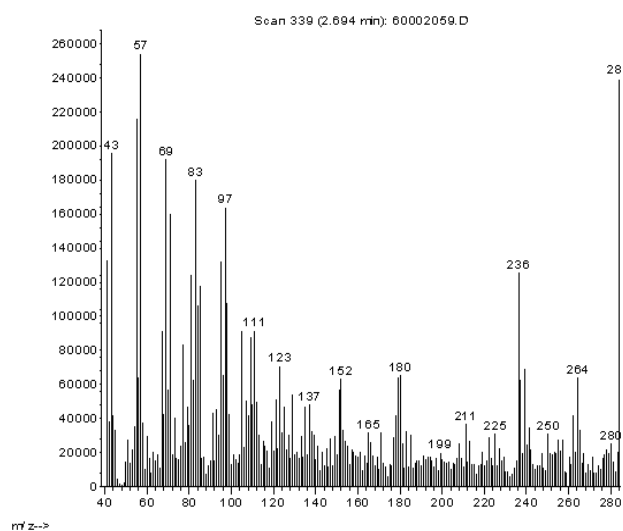




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