

Fabrication and Evaluation of Basil-Essential Oil Loaded Halloysite-Nanotubes in Chitosan Nanocomposite Film and Its Application in Food Packaging

Narayan Chaudhary ¹, Gourav Mishra ^{1,*} , Tushar Yadav ², Nishant Srivastava ¹, Vimal K. Maurya ³ and Shailendra K. Saxena ^{3,*} 

¹ Nanotoxicity & Drosophila Research Laboratory, Department of Biotechnology, Meerut Institute of Engineering and Technology, Meerut 250005, India.

² Department of Zoology, Jawaharlal Nehru Smriti Government Postgraduate College, Shujalpur 465333, India.

³ Centre for Advanced Research (CFAR), Faculty of Medicine, King George's Medical University (KGMU), Lucknow 226003, India. <http://orcid.org/0000-0003-2856-4185>

* Corresponding Authors: *mishragourav88@gmail.com (GM)  <https://orcid.org/0000-0001-8060-5277>; *shailen@kgmcindia.edu; Tel: 91 522 2257450; Fax: 91 522 2257450;  <http://orcid.org/0000-0003-2856-4185> (SKS)

1. Scanning electron microscope (SEM)

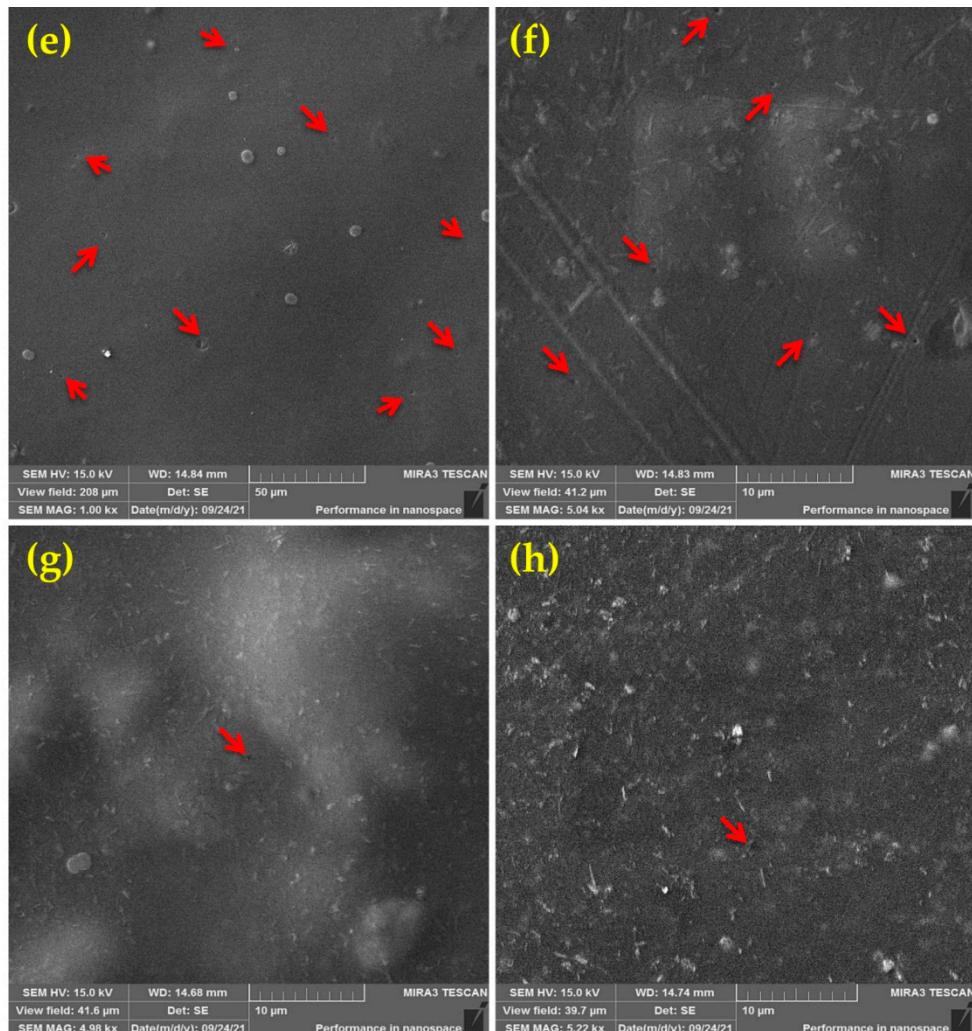


Figure S1. Scanning Electron Microscopy (SEM) images of the films (e) Ch/BEO (f) Ch/BEO/HNTs - 5 % (g) Ch/BEO/HNTs - 15 % (h) Ch/BEO/HNTs - 30 %.

2. Energy Dispersive X-ray Spectroscopy (EDS) Analysis

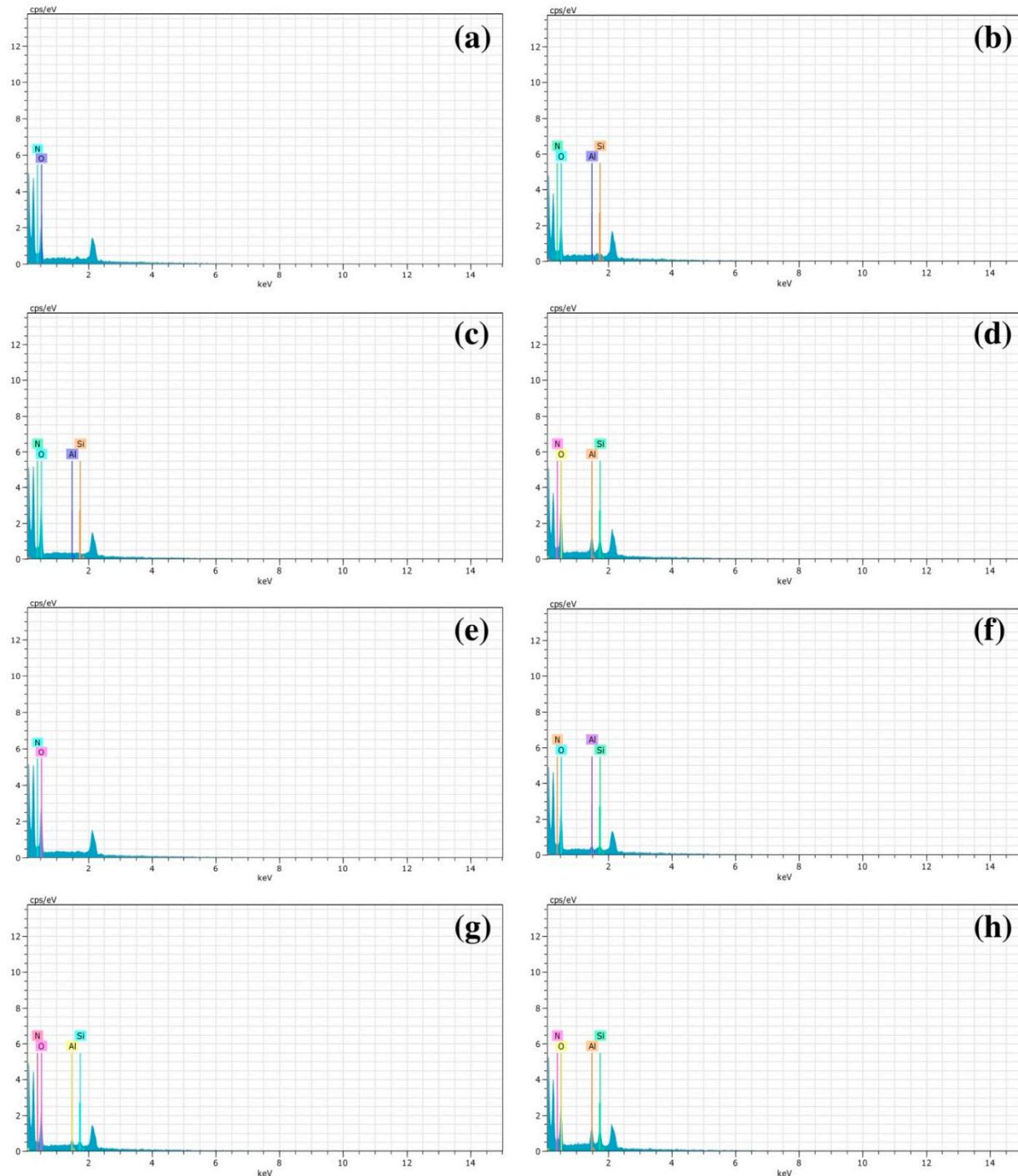


Figure S2. Energy Dispersive X-ray Spectroscopy (EDS) analysis of the films (a) Ch film (b) Ch/HNTs - 5 % (c) Ch/HNTs - 15% (d) Ch/HNTs - 30 % (e) Ch/BEO (f) Ch/BEO/HNTs - 5 % (g) Ch/BEO/HNTs - 15 % (h) Ch/BEO/HNTs - 30 %.

3. Cost estimation.

Cost of 9 cm² film

- Cost of Chitosan (cost of 100 g chitosan polymer (HiMedia) is Rs 3422, therefore cost of 0.5 g of chitosan polymer INR 17)
- Cost of Halloysite Nanotubes (HNTs) wt15% (cost of 100 g of HNTs (Sigma-Aldrich) is INR 3500, therefore cost of 0.15 g INR 5)
- Cost of Basil Essential Oil (BEO) (cost of 250 ml of BEO (John Aromas Co.) is INR 462, therefore cost of 0.5 ml is approx INR 1)
- Cost of Acetic acid (cost of 500 ml of acetic acid is INR 366 (HiMedia), therefore cost of 0.5 ml is approx INR 1)
- Cost of Glycerol (cost of 500 ml of glycerol is INR 535 (HiMedia), therefore cost of 0.2 ml is approx INR 1)

Utilities

- Magnetic Stirrer 500 watt
- DI water 50 ml = INR 1

The cost of magnetic stirrer used for 12 h = power kW x time (h) x cost of electricity

$$= 0.550 \times 12 \times 5$$

$$= 33 \text{ INR}$$

Therefore, the cost of polymer film

Materials with quantity	Cost (INR)
0.5 g chitosan	17
0.15 g HNTs	5
0.5 ml BEO	1
0.5 ml acetic acid	1
0.2 ml glycerol	1
50 ml DI water	1
Electricity	33
Total	59 INR