The Desalination properties of Epoxy-Graphene nano composites

Dr. Sangeeta Kulkarni

Govt. First Grade College, Kumareshwar Nagar, Dharwad, Karnataka. 580008.

Email id: sangeeta_bk1234@yahoo.com

ABSTRACT

The study of amount of graphene when used as nano sheets in polymer matrices to form advance multifunctional material is one of the most promising research field. The effect of graphene on the desalination properties of epoxy coating has been evaluated by incorporating different concentration. In this study, the effect of graphene on the desalination properties of epoxy nano composites has been evaluated by incorporating concentration of nano particles i.e. 0.75% and 1.5% weight of graphene into epoxy polymer matrix. Epoxy graphene nano composites were characterized using X-ray Diffraction (XRD) and Fourier-Transformed Infra-Red (FT-IR) techniques and the thermal behavior of the composites is analyzed using thermogravimetric analysis (TGA).The desalination properties of the epoxy composites were investigated by using PH meter and Conductivity meter

INTRODUCTION

The worldwide industrialization and population growth has caused extensive environmental pollution which has affected the quality of human life. One of the major threat is the quality of water and also scarcity of water. In order to meet the scarcity of water desalination is the advanced technique which approaches to the supply of new fresh water in the contest of rapidly growing global water gap. Even though world's 97% water content is from seas and oceans, desalination account for the fraction of percent of the portable water supply [1]. The thermal desalination methods such as multistage flash and multi effect distillation are seem to be more expensive [2].

The Porous nano materials like graphene have greater deal to offer over exsisting technologies for desalination [3]. There is a huge scope for graphene based materials to be used as membranes for desalination. It is observed that 100% salt rejection is observed for commonly used ions by utilizing single layer of graphene. The graphene oxide membranes with cost effective fabrication can control pore size and offer filtration with 100% salt rejection [4]. Some of the diversed functional groups also provide foundation for composites contract with graphene which found to be reinforce the mechanical stability and enhancement of membrane properties. Some of the oxygenated functional groups such as epoxy group

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endor the graphene oxide with hydrophilicity and PH censitivity [5,6] since hydrophobic region regulate the water flow, the functional group density should be controlled during the fabrication. This paper introduces the application of graphene oxide and epoxy graphene nano composites of various graphene content [0.75% and 1.5%] to desalinate sea water.

EXPERIMENTAL TECHNIQUE

MATERIALS

One gram of graphite and 0.5 gram of sodium nitrate are mixed followed by the addition 33ml of concentrated sulphuric acid under constant stirring after one hour 3gm of Kmno4 is added gradually to the above solution while keeping the temperature less than 20^0 to prevent overheating and explosion the mixture is sturred at 35^0 for 12 hours the resulting solution is diluted to 500ml under vigrous stirring to ensure the completion of reaction with Kmno4 the suspension is further treated with 30% H2O2 solution. The resulting solution is washed with water repeatedly followed by filtration and on drying graphene oxide sheets are obtained.

The commercial epoxy system is a water borne resin without corrosion inhabiter it contains additives normally used in the production of commercial resume. In order to evaluate the influence of dispersed graphene on the polymer matrix specific amount of graphene were chosen (0.75% and 1.5%). The dispersion of graphene into epoxy resin has obtained using ultrasonic bath with frequency of 50 HZ frequency for 20 minutes. Blending of resin with graphene particles of 2 micro meter average thickness with surface area of 500 mts square per gram by means of harmet box keeping the container refrigerated.

RESULTS AND DISCUSSION

1. **FOURIER TRANSFORM INFRARED ANALYSIS**: Table 1 shows FTIR spectra of graphene oxide and epoxy graphene nano composites the broad bands appeared at the range of 3442.7 per cm^{-1} it is O-H stretching ,C=O and C-O are proved that graphene oxide is present in the epoxy nano compositie

Sl.No	Frequency range per centimeter	Functional group
1	3442	O-H stretching
2.	2361	Co2 stretching
3.	1383	Co stretching

2. **XRD** Two peaks are observed in the XRD spectrum of graphene oxide and epoxy graphene nano composites the first peak appeared at the range 22- 30^0 which is broad in the case of graphene oxide, on adding polymer into graphene oxide GO. The intensity of the first peak becomes narrow and sharp.

3. **TG/DTA**: The TG curve of Go show significant weight loss upto 210 which is attributed to the loss of CO and CO2 from the decomposition of oxygen containing functional group the graphene oxide nano sheets show mass loss in the temperature range of 200 to 300^0 with illustrate much lower thermal stability when compared to natural graphite.(7and 8) The thermal analysis of epoxy graphene nano composites were carried out at 250^0 with the heating rate of $10^0 C$ per minute

4. **PH Meter** :The collected sea water from sea is desalinated by vapour collection method to this about .04gm of synthsised graphene oxide is added to the 25ml of sea water the reaction mixture is boiled for 30 minutes and resulting vapour are collected in the test tube similarly this process is carried out for epoxy graphene with .75 and 1.5 gm graphene respectively. The desalinated sea water is confirmed by PH and conductivity values

   The PH of sea water is 7.7 which is slightly basic in nature after desalination of Sea water with graphene the PH range is 6.98. Desalination process was also carried out for epoxy graphene nano composites with (0.75 and 1.5). The PH values obtained there as follows

Compound Epoxygraphene with graphene content	PH
0.75	6.5
1.5	6.0

When compared to graphene oxide and epoxy graphene nano composites show better results for desalination process that is with increase in the amount of graphene with (1.5%) show very good result then with 0.75%. It is concluded that increase in the amount of graphene is proved by the result of decrease in PH which is due to the more hydrophylicity and PH sensitivity of nano

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composites.

5. **Conductivity meter**: Generally desalination refers to the removal of salts and minerals from target substances the conductivity value prove the desalination .The epoxy graphene nano composites with different amount of graphene (0.75 and 1.5) and sea water have been used as matrices to prepare electrically conductive epoxy graphene nano composites

The table 2 shows the conductivity value of various epoxy graphene nano composites

Compound Epoxygraphene with graphene content	Conductance
GO	0.62
0.75	0.34
1.5	0.22

The conductivity is measured after desalination using conductivity meter the conductance of sea water is around 1 Mho the conductance of graphene oxide and epoxy grap hene nano composites slightly decrease with increase in the amount of graphene. The conductivity measurements were confirmed by desalination of sea water because H+ concentration is reduced by the desalination so conductance also reduced.

CONCLUSION

Graphene oxide nano sheets and epoxy graphene nano composites are synthasied successfully by dispersion method polymers are perfectly incorporated into GO grapheneoxide which is confirmed by FTIR ,XRD. GO and epoxy graphene nano composites show good thermal stability which is confirmed by DTA. The epoxy graphene show good desalination property when compared to graphene oxide GO which is proved by PH meter and conductivity meter.

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