List of Presentations

1. **Oral Presentation**: IWA, The 6th International Water Accusation Regional Membrane Technology Conference 11th December 2018

2. **Poster Presentation**: 56th Annual Convention of Chemist 2019 organized by 'INDIAN CHEMICAL SOCIETY' NOVEMBER 14-16, 2019, Raipur-492010, Chhattisgarh, India

3. Attended: UGC-CPEPA Sponsored, National Seminar on Applied Polymer Science and Technology (NSAPST-2019) Organized by Department of Chemistry, Sardar Patel University, Vallabh Vidhyanagar-388120, Gujarat, India.

4. **Poster Presentation/Second Prize**: National symposium on Climate Change, Pollution and Harmony with Nature, 25 January, 2020, organized by Department of Geography, The Maharaja Sayajirao University of Baroda, The Institution of Engineers (India) Vadodara, Indian Association of Air Pollution Control.

5. **Oral presentation**: 9th DAE - BRNS biennial symposium (Webinar) on "Emerging trends in separation science and technology (e-SESTEC-2020) Organized by BARC, Mumbai, India

6. **Poster presentation**: Virtual International Conference on "Advances in Sustainable Research for Energy and Environmental Management (ASREEM-2021)", August 6th, 2021, Department of Chemical Engineering, Sardar Vallabhbhai National Institute of Technology Surat-395007, Gujarat, India

7. **Oral presentation**: 12th International Conference (Virtual) on "Advancements in polymeric (APM-2021)", March 9th, 2021, Bhubaneswar, India.

8. **Oral Presentation**: 1st International Conference on "Advances in Water Treatment and Management" (ICAWTM-22) 25-26 March 2022, organized by Pandit Deendayal Energy University, Gandhinagar, Gujarat, India.

9. **Poster Presentation**: 16th International Conference on Science and Technology of Polymers and Advanced Materials through Innovation, Entrepreneurship and Industry 2nd to 4th November, 2022, (SPSI - MACRO – 2022) organized by CSIR - NCL, Pune, India.

10. **Best Oral Presentation Award**: International Conference on "Membrane based Separations: Past, Present & Future" Celebrating the 100th Birth Anniversary of Prof. S. Sourirajan. Held at MSU Baroda, Vadodara, Gujarat, India.

Workshop

1. One- week STUTI Training Program on the theme SPECTROMETRIC ANALYSIS AND IMAGING OF BIOLOGICAL SAMPLES organized by Sophisticated analytical and Technical Help Institute (SATHI), Banaras Hindu University and National Institute of Technology, Warangal during 25 April, 2023 – 1 May, 2023 at Central Discovery Centre, BHU, Varanasi.

List of Publications

1. Modification of surface characteristics of functionalized multi-walled carbon nanotubes containing mixed matrix membrane using click chemistry. Priyanka Mistry, Km Nikita, V.K. Aswal, S. Kumar, C.N. Murthy*, *Desal. Wat. Treat.,* **2023**, 295, 42-51. doi: 10.5004/dwt.2023.29589.
2. Positively Charged Polysulfone and Polyether Sulfone Mixed Matrix Membranes Modified with Polyethylenimine: Enhancing Heavy Metal Rejection and Antifouling Properties. Priyanka Mistry and C. N. Murthy*, *ACS EST Water*, **2023**, 3, 4168−4182. https://doi.org/10.1021/acsestwater.3c00585.
3. Book Chapter: Studies on the f-MWCNT/PES Mixed Matrix Membranes for Water and Wastewater Treatment. Priyanka Mistry and C.N. Murthy. Environmental Pollution, Climate Change and Altered Lifestyle during COVID, PART 2 - Pollution: Management Strategies, **2022**, Daya Publishing House® A Division of Astral International Pvt. Ltd. New Delhi – 110 002. ISBN: 978-93-5461-317-3 (HB).

Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2023.29589

295 (2023) 42–51
May

Modification of surface characteristics of functionalized multi-walled carbon nanotubes containing mixed matrix membrane using click chemistry

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Received 5 February 2023; Accepted 27 April 2023

ABSTRACT

This work probes the polysulfone/azide-functionalized multi-walled carbon nanotubes mixed matrix membrane where the azide groups were converted into triazole rings. This modification was confirmed from X-ray photoelectron spectroscopy studies. Post modification, unlike the polyethersulfone based mixed matrix membranes, these membranes show improved heavy metal rejection. Membrane morphology by atomic force microscopy and scanning electron microscopy images shows membrane bulk morphology does not change after the modification. Also, the modified membrane showed better antifouling property with high flux recovery ratio and lower irreversible fouling as compared to the polyethersulfone-based membrane. This modified membrane shows smaller pore size as compared to modified polyethersulfone mixed matrix membrane due to their different morphology. Surface energy provides additional information such as the wetting and adhesion characteristics of the membranes. These results indicate that the pristine membrane morphology has profound influence on the final morphology of mixed matrix membrane it becoming more hydrophilic and permeable post modification. Surface modified membrane via click reaction gives nearly 99% rejection for Cu(II), 90% rejection for Pb(II) and 95% rejection for Cr(VI), which is higher than the unmodified and pristine polysulfone membranes.

Keywords: Polysulfone; Functionalized carbon nanotubes; Click reaction; Surface modification; Antifouling; Heavy metal rejection

Environmental Pollution, Climate Change and Altered Lifestyle during COVID

Part 2

Pollution: Management Strategies

Chapter 7

Studies on the f-MWCNT/PES Mixed Matrix Membranes for Water and Wastewater Treatment

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ABSTRACT

Water shortages have become a major problem facing the world today. Membrane separation technology is commonly used in water treatment applications. The development of new materials for water treatment can reduce the energy required for water treatment, reduce cost, and improve efficiency. Ionic and molecular sieving membranes that enable fast solute separations from aqueous solutions are essential for processes such as water purification and desalination, sensing, and energy production. Nanomaterials exhibit excellent properties such as great chemical and physical stabilities, lower density, and large surface area. These excellent properties of nanomaterials make them popular candidates for the design and development of novel functional nanomaterial-based membranes. The combination of membranes with the unique properties of nanomaterials provides excellent physical and chemical stability, and also high rejection behavior of the nanomaterial-based membrane toward target compound/s. The design and development of novel membranes can be done by combining with nanomaterials such as graphenes, fullerenes, carbon nanotubes, and nanoparticles. Preparation methodologies of these nanomaterial-based membranes, as well as their potential in the effective separation of target compounds from environmental samples are discussed in detail. f-MWCNT/PES mixed matrix membrane were prepared via phase inversion method. It is also concluded that because of the tube-like structure CNTs are vertically aligned to the surface of the membrane, due to this pore

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Article

Positively Charged Polysulfone and Polyether Sulfone Mixed Matrix Membranes Modified with Polyethylenimine: Enhancing Heavy Metal Rejection and Antifouling Properties

Priyanka Mistry and C. N. Murthy*

Cite This: ACS EST Water 2023, 3, 4168−4182

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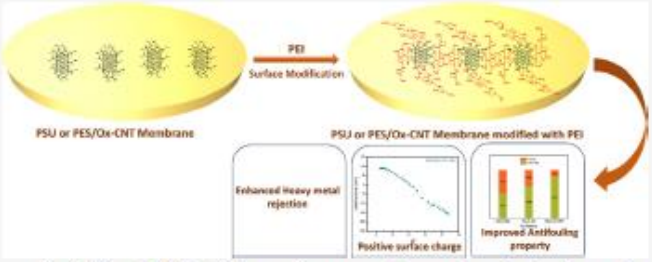

ABSTRACT: In this study, a PSU or PES/Ox-CNT mixed matrix membrane with carboxylic functional groups on the surface underwent modification with polyethylenimine (PEI). The treatment resulted in the introduction of amine functional groups and the conversion of carboxylic acid to amide. The modification was confirmed through FT-IR and XPS, which showed the presence of amine functional groups on the membrane surface and the conversion of carboxylic acid to amide. The zeta potential of the modified membrane was more positive under acidic conditions due to the protonation of the amines on the membrane surface. A positive charge on the membrane surface improves the antifouling properties and enhances heavy metal rejection by electrostatic repulsion. The surface roughness slightly increased after the surface treatment, indicating the formation of amide linkages on the membrane surface. However, the bulk morphology of the membrane remained unchanged. The modified PSU/Ox-CNT membrane with PEI gave slightly improved heavy metal rejection and BSA rejection compared to the modified PES/Ox-CNT membrane with PEI, owing to the structural difference between them. For the same reason, the antifouling properties were enhanced. However, both membranes exhibited ~98% heavy metal rejection and ~95% BSA rejection, which were higher than those of the unmodified membranes. This has implications for applications such as water treatment, where the goal is to purify water by removing contaminants such as heavy metal ions.

KEYWORDS: *polysulfone (PSU), polyether sulfone (PES), surface modification, polyethyleneimine (PEI), surface charge, heavy metal rejection, bulk morphology*