

Dr. Hiren D. Raval

**Water Advanced Research and Innovation Fellow-University of Nebraska Lincoln.
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Experience

- **Feb. 2010 Onwards as a Scientist with CSIR-Central Salt and Marine Chemicals Research Institute, Bhavnagar (A Constituent of CSIR India)**
Council of Scientific and Industrial Research (CSIR), India's Large, Public funded Research & Development organization ranked 9th public funded research institution in the world
- **From Feb'07 to Jan. '10 with Larsen & Toubro Limited, (Water Process Technology SBU), Baroda as Sr. Process Engineer/ Manager**
Larsen and Toubro Limited, India's large multinational Engineering, Procurement, Construction Company
- **June'05-Jan'07 as Jr. Scientist with Central Salt and Marine Chemicals Research Institute, Bhavnagar (A Constituent of CSIR India)**
- **Jul'04-May'05 as Lecturer in Chemical engineering at Faculty of Technology and Engineering, The M.S. University of Baroda (Taught at undergraduate and graduate level)**
(The M S University of Baroda is a University in Gujarat, India)
- **Feb'04-Jun'04 at V.V.P. Engineering college Rajkot as Adhoc Lecturer in Chemical Engineering (Taught at undergraduate level)**
(VVP Engineering College is an academic institution in Gujarat, India)

Education

- **PhD in Chemical Engineering** from Gujarat Technological University Ahmedabad
Thesis title: "Improvement in energy efficiency of solar powered reverse osmosis by modification in membrane morphology and recovery of thermal energy from solar Photovoltaic panel" completed in October 2016.
- **M.E. (Chemical Engineering) with Specialization Polymer technology** from The M.S. University of Baroda in Jan. 2003 - Secured **CGPA 3.90 out of 4.00**
- **B.E. (Chemical Engineering)** from Saurashtra University Rajkot in 2001. - Secured **CGPA 3.95 out of 4.00**

- **Executive Diploma Program in International Business** from Nirma University Ahmedabad with CGPA 3.215 /4.333 in 2009.
- Academic merit: Qualified Graduate Aptitude Test in Engineering (**GATE-2002**) with **89.82 Percentile, IELTS 2011 with overall band score 6.0**

Achievements

- Awarded a **prestigious “Water Advanced Research and Innovation Fellowship-2018 at University of Nebraska Lincoln, USA** out of a national level competition by Indo-US Science and Technology Forum, Department of Science and Technology India, Daugherty Water for Food Institute and University of Nebraska Lincoln.
- Awarded an international fellowship by **International Desalination Association fellowship-2011**, where only one person was awarded the fellowship in global competition for year 2011.
- Awarded prestigious **BHARAT JYOTI AWARD** for contribution in science and Technology
- Selected for **Marquis who’s who- 2014** (where Individuals become eligible for listing by virtue of their positions and/or noteworthy achievements that have proved to be of significant value to society)
- Awarded the **L & T ICON 2007-08** for contribution to Membrane Process Design

Publications

1. Ankoliya, D.* , Mehta, B., & **Raval, H.*** (2018). Advances in surface modification techniques of reverse osmosis membrane over the years. *Separation Science and Technology*, 1-18.
2. **RAVAL, H. D.***, Makwana, P., & Sharma, S. (2018). Biofouling of Polysulfone and Polysulfone-Graphene Oxide nanocomposite Membrane and Foulant removal. *Materials Research Express*.
3. Mehta, B. B., Joshi, R. N., & **Raval, H. D.*** (2018). A novel ultra-low energy reverse osmosis membrane modified by chitosan with glutaraldehyde crosslinking. *Journal of Applied Polymer Science*, 135(10), 45971.
4. Samnani, M., Rathod, H., & **Raval, H.*** (2018). A novel reverse osmosis membrane modified by polyvinyl alcohol with maleic anhydride crosslinking. *Materials Research Express*, 5(3), 035304.
5. Vadodariya, N., Chaudhary, J. P., **Raval, H. D.**, & Meena, R.* (2018). Graded agaroses directly from seaweed biomass: A sustainable tool for developing clean chemical process. *Process Biochemistry*, 66, 171-175.

6. **Raval, H. D.***, Raviya, M. R., & Rathod, H. C. (2018). Polyamide–surfactant interaction: Exploration of new avenues for reverse osmosis separation applications. *Advances in Polymer Technology*.
7. **Raval, H. D.***, Samnani, M. D., & Gauswami, M. V. (2018). Surface modification of thin film composite reverse osmosis membrane by glycerol assisted oxidation with sodium hypochlorite. *Applied Surface Science*, *427*, 37-44.
8. **Raval, H. D.***, Raviya, M. R., & Gauswami, M. V. (2017). A novel reverse osmosis membrane by ferrous sulfate assisted controlled oxidation of polyamide layer. *Materials Research Express*, *4*(11), 115303.
9. **Raval, H. D.***, & Das, R. K. (2017). A novel approach to bind graphene oxide to polyamide for making high performance Reverse Osmosis membrane. *MEMBRANE WATER TREATMENT*, *8*(6), 613-623.
10. **Raval, H.***, Samnani, M., Gauswami, M., & Makwana, P. (2017). Combinatorial approach for removal of boron from water by membrane surface modification and boron complex formation. *Journal of Water Process Engineering*, *19*, 139-146.
11. **Raval, H. D.***, Mehta, B. B., & Joshi, R. N. (2017). A novel low-fouling zeolite-polysulfone nanocomposite membrane for advanced water treatment. *DESALINATION AND WATER TREATMENT*, *88*, 8-15.
12. **Raval, H. D.***, & Gondaliya, M. D. (2017). A novel high-flux thin film composite reverse osmosis membrane modified by polysaccharide supramolecular assembly. *Journal of Applied Polymer Science*, *134*(27), 45026.
13. Lakshmi, D. S.* , Jaiswar, S., Tasselli, F., & **Raval, H. D.** (2017). Preparation and performance of biofouling resistant PAN/chitosan hollow fiber membranes. *3 Biotech*, *7*(3), 224.
14. **Raval, H. D.***, & Koradiya, P. (2016). Direct fertigation with brackish water by a forward osmosis system converting domestic reverse osmosis module into forward osmosis membrane element. *Desalination and Water Treatment*, *57*(34), 15740-15747.
15. **Raval, H. D.***, & Maiti, S.* (2016). Ultra-low energy reverse osmosis with thermal energy recovery from photovoltaic panel cooling and TFC RO membrane modification. *Desalination and Water Treatment*, *57*(10), 4303-4312.
16. **Raval, H. D.***, & Maiti, S. (2015). A Novel Photovoltaic Powered Reverse Osmosis with Improved Productivity of Reverse Osmosis and Photovoltaic Panel. *Journal of Membrane Science and Research*, *1*(3), 113-117.

17. **Raval, H. D.***, Raval, A. H., Bhatt, J. H., & Pandya, R. P. (2015). Study on removal of m-phenylenediamine from aqueous solution by adsorption over granular activated carbon.
18. **Raval, H. D.***, Rana, P. S., & Maiti, S. (2015). A novel high-flux, thin-film composite reverse osmosis membrane modified by chitosan for advanced water treatment. *Rsc Advances*, 5(9), 6687-6694.
19. **Raval, H. D.***, Maiti, S., & Mittal, A. (2014). Computational fluid dynamics analysis and experimental validation of improvement in overall energy efficiency of a solar photovoltaic panel by thermal energy recovery. *Journal of renewable and sustainable energy*, 6(3), 033138.
20. Meena, R. *, Chaudhary, J. P., Agarwal, P. K., Maiti, P., Chatterjee, S., **Raval, H. D.**, ... & Ghosh, P. K.* (2014). Surfactant-induced coagulation of agarose from aqueous extract of Gracilaria dura seaweed as an energy-efficient alternative to the conventional freeze–thaw process. *RSC Advances*, 4(53), 28093-28098.
21. **Raval, H. D.***, Chauhan, V. R., Raval, A. H., & Mishra, S. (2012). Rejuvenation of discarded RO membrane for new applications. *Desalination and Water Treatment*, 48(1-3), 349-359.
22. Rangarajan, R., Desai, N. V., Daga, S. L., Joshi, S. V., Rao, A. P., Shah, V. J., ... & **Raval, H. D.** (2011). Thin film composite reverse osmosis membrane development and scale up at CSMCRI, Bhavnagar. *Desalination*, 282, 68-77.
23. **Raval, H. D.***, Trivedi, J. J., Joshi, S. V., & Devmurari, C. V. (2010). Flux enhancement of thin film composite RO membrane by controlled chlorine treatment. *Desalination*, 250(3), 945-949.
24. **Raval, H. D.***, & Gohil, J. M. (2010). Nanotechnology in water treatment: an emerging trend. *International Journal of Nuclear Desalination*, 4(2), 184-188.
25. **Raval, H. D.***, & Gohil, J. M. (2009). Carbon nanotube membrane for water desalination. *International Journal of Nuclear Desalination*, 3(4), 360-368.
26. **Raval H.D.***, Swain A.K. (2005) Multiple Extrusions of HDPE: Study of degradation and stabilization Chemical Product Finder Journal p. 45.
27. A.K. Swain*, **H.D. Raval (2005)** Copolymer of Methyl Methacrylate and Methacrylic acid: synthesis and characterization, Chemical Engineering World, pp. 86-89.

Conference presentations/Invited talks

1. Mohit Samnani, Harshad Rathod, Hiren Raval* Polyvinyl alcohol and Maleic anhydride mixture assisted surface modification of TFC RO membrane Recent trends in membrane science and technology, November 2017, CSIR-CSMCRI Bhavnagar, India.
2. Maulik Gauswami, Mayur Raviya, Hiren Raval* Boron removal strategies by Reverse Osmosis membranes Recent trends in membrane science and technology, November 2017, CSIR-CSMCRI Bhavnagar, India.
3. Dipak Ankoliya, Bhargav Mehta, Hiren Raval* Advances in surface modification techniques of Reverse Osmosis membrane over the years Recent trends in membrane science and technology, November 2017, CSIR-CSMCRI Bhavnagar, India.
4. Hiren D. Raval*, Bhargav B. Mehta, Mayur R. Raviya, Harshad C. Rathod “A novel low-fouling polysulfone nano-composite membrane for advanced water treatment” International conference on membranes (ICM 2017) Alleppey, Kerala.
5. Hiren D. Raval*, Mohit D. Samnani, Prashant A. Makwana, Maulik Gauswami “Novel approach to reduce the Boron concentration in Reverse Osmosis permeate” International conference on membranes (ICM 2017) Alleppey Kerala.
6. Hiren D. Raval*, Pranav S. Rana, Subarna Maiti “A novel high-flux Thin Film Composite RO membrane modified by chitosan for advanced water treatment” at India International Science Festival December 2016, New Delhi.
7. Hiren D. Raval*, Subarna Maiti “Ultra-low energy Reverse Osmosis by thermal energy recovery from solar photovoltaic panel cooling and modification in membrane morphology” at India International Science Festival December 2016, New Delhi – 2nd Prize.
8. **Invited talk** on “Recent advances in Thin Film Composite RO membrane development and applications” for a short term training program entitled “Advances in Membrane developments and hand on experience” in October 2016 at SVNIT Surat.
9. **Invited talk** on “Desalination using Renewable Energy Sources” for a Short Term Training Program entitled Recent trends in Chemical Engineering in July 2016 at SVNIT Surat.
10. H.D. Raval*, S. Maiti, A. Ghassemi, L. Karimi (2014) “Options for improving attractiveness of renewable energy powered desalination” at AIChE Annual meeting-2014 **Atlanta, GA, USA.**
11. H.D. Raval*, A.H. Raval, V.R. Chauhan (2013) “New life of discarded RO membrane for alternate applications”, IDAWC-2013 published in proceedings Tianjin, China

12. H. D. Raval* (2014) "Recent advances in membrane technology" **invited lecture** at Dharmasinh Desai University Nadiad, March-2014.
13. H.D. Raval* (2014) "New avenues in membrane science and technology" **invited lecture** for a short term training program at VVP Engineering College in June-2014.
14. H.D. Raval* (2010) "Nanotechnology in Water Treatment: An emerging trend" **invited speech** at Global R & D Conclave-2010 at New Delhi.
15. H.D. Raval* (2008) "Desalination in India and Middle-East: Current Trends Future Prospects" at CHEMCON -2008, Chandigarh.
16. H.D. Raval* (2006) "Dual role of chlorine on TFC membrane post treatment" an International symposium organized by Indian Desalination Association in March 2006 at Jaipur.
17. H.D. Raval*, A.K. Swain (2004) "Degradation of film grade HDPE during processing" presented in CHEMCON-2004, a joint symposium of IICHE and AICHE.
18. H.D. Raval* (2002) "Metallocene Catalyst initiates New Era in Polymer Synthesis" presented in a national level paper presentation FOOTPRINTS-2002.

Membership

Associate Member of Royal Society of Chemistry (**AMRSC**), Life member of Indian Institute of Chemical Engineers (**IICHE**), Life Member of Indian Desalination Association(**InDA**), Member of Gujarat Science Academy.

Reviewer

Journal of Membrane Science, Chemical engineering, Environmental Science and Technology, Materials research express, Desalination and water treatment, Journal of water process engineering, Thermal science etc.

Projects handled

As a Principal Investigator

- Value creation from solid waste: Discarded Reverse Osmosis membrane elements sponsored by Department of Science and Technology (Status: Ongoing, INR 2.69 Cr.)
- Recycling of thin film composite RO membrane by removal of polyamide layer and in situ interfacial polymerization CSIR EMPOWER Project (Status: Completed)

As a team member

- Membranes with improved performance and enhanced fouling resistance for desalination and water purification
- Membrane and adsorbent technology platform for effective separation of gases and liquids
- A consolidated biomass process for integrated production of multiple products from fresh marine microalgae.

Foreign visits

- July- August 2011 as an International Desalination Association Fellow-2011, Host agency: US Bureau of Reclamation, Denver, Colorado, USA
- November-2014 attended AIChE Annual meeting-2014 at Atlanta, GA, USA for presenting a paper
- October-November 2017 Mexico – For collaboration on PV-RO with ITSON Sonora.
- May 2018 as a “Water advanced research and innovation fellow” to University of Nebraska Lincoln (ongoing)