

Develop drinkable water for clean water deprived villages;

Using Nano-composite Hydrogels and Desalination Bags

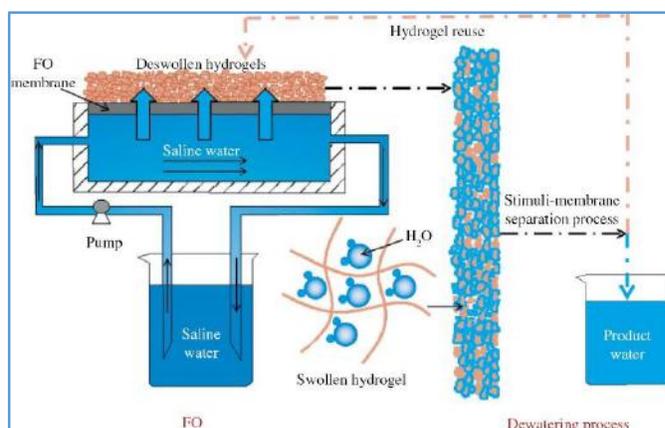
Project In-charge: Dr. D. Arunbabu

Water scarcity and access to clean drinking is still a privilege to those living in remote villages. Forward Osmosis Desalination is an energy efficient desalination technology which aims to address this issue.

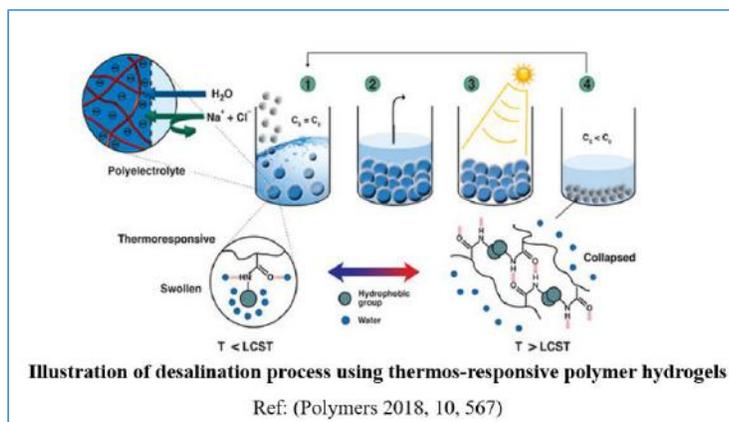
This project aims to help rural communities living in water deprived conditions or people who have no access to clean drinking water, to provide means to provide them clean drinking water.

This project is possible through generous funding received from **Dassault Systemes Foundation** (<http://lafondation.3ds.com/>) and also technical mentoring and support for research by their technical experts to develop efficient Nano hydrogel material and material for desalination bags.

The project uses FO desalination process (Forward Osmosis desalination Process). It is a two-step draw and dilution process. Draw process occurs due to osmotic pressure gradient where pure water flows from low concentration solution to high concentration solution. Once the pure water is drawn into draw solutes water can be recovered by different stimuli mechanisms such as just boiling, heating and UV sun light.



We are developing stimuli-responsive polymer hydrogels as potential draw agents which can be employed to develop desalination bags to provide drinking water for water deprived societies. Thermo-Responsive Nano-composite Polymer Hydrogels are developed through extensive research and software based simulation tools (BIOVIA) to design appropriate molecule design for intended functioning.



Our project also aims to develop thermo-responsive polymers for fabrication of desalination bags. As a model platform we have demonstrated that poly (NIPAM) hydrogels can draw the pure water and exposing hydrogels to sunlight to heat ($>37^\circ\text{C}$ (LCST)) pure water can be extracted for further use. Responding to heat (including heat from sun light which is abundantly available in our country), these hydrogels shrink so the drawn water can be squeezed and harvested.

Learning opportunity for the students through this project

- Undergraduate students will be working on developing Nano-particle draw solutes
- They will learn the synthesis of FO draw agents by various photo and living polymerization techniques, characterization and fabrication
- Have opportunity to learn very powerful molecular modeling and simulation software like BIOVIA
- Students will learn research methodologies and research culture will be enhanced
- Students will be encouraged to build their own research career

Social impact the project aims to achieve:

Develop innovative and easy to use mechanism to extract clean drinking water to remote villages, localities who have no access to water purification systems. Providing Desalination bags which would be outcome of this project will help people living in such remote areas a way to extract clean drinking water from the raw water available to them.

Students and village youths will be trained to design and fabricate Desalination Bags for water purification. This training will equip villagers/people who have no access to clean drinking water to prepare their own semi-permeable membranes and Construct desalination pouch; and also provide livelihood opportunities for village youths.

About Dassault Systemes Foundation (<http://lafondation.3ds.com/>):

La Foundation Dassault Systemes (Dassault Systemes Foundation, India) aims to develop a more sustainable society by driving innovations and improvisations in education, research and heritage and enabling a broader and more equal access to them by coupling the potentials of virtual universes and experiences.

The Desalination project which aims to serve our society in impeccable ways is generously supported by La Foundation Dassault Systemes. Also by supporting progressive institutes like ours which are located in interior parts of our country, La Foundation Dassault Systemes is motivating young researchers from such areas to explore and materialize innovative research ideas and provide a platform for students and professors to do research for social and sustainable innovation, develop newer learning approaches and help students to be future ready.



Nikhil Chowdary, P., (4th Year ME) is working on the development of pH (PAAc) and Thermo- responsive Polymers (PNIPAM and Poly(diethylacrylamide)) for FO Desalination.



Parinitha,G, Rukhaya, S.M., (I B.tech., CSE 3rd Year) are developing thermo-responsive Polymers (PDEAEMA or PVCL) for Desalination (Experiment and Simulation)

