“Industrial wastewater reclamation utilizing an engineered membrane with disparate wetting ability”- Sifat Kalam, PhD in Civil Engineering

Just think, are you privileged? because I am… I have clean water running through my tap, while almost two thirds of the world population under water stress condition. This situation becoming more challenging as our industries need a continuous supply of clean water for production, and they also generate huge wastewater load that has high salt & contain contaminants like oil/surfactants- for example oil gas industries, therefore this WW needs to be treated before discharge- can we not we supplement water demand through industrial wastewater desalination? Yes, we can!- by implementing a Membrane based distillation technology. But let me tell you a story- water, oil, salt and surfactants were swimming in the industrial wastewater hot pool, they came across a commercial membrane that did not allow the salt to pass through, while the water was passing through as vapor- not the liquid water. The oil was very happy to attach on the membrane surface clogging it (fouling)- and now the water vapor can’t pass anymore. Surfactants also happy to wet the surface!- and surprise!- salt could pass through! Now that is not good news to us! Because both quantity and quality of water got compromised. Also the fouled & wet membrane as seen on the left picture will need to be replaced- cost goes up.

Here comes my PhD work- to engineer the membrane with special power to prevent fouling & wetting during the membrane-based distillation desalination process- the center image. imagine the well-known distillation process with my engineered membrane, separating the hot wastewater side from the cold clean water side preventing any liquid to pass throw, due the high temp, evaporation taking place allowing the blue water vapor to happily pass to the cold side through the air gaps and get condensed rejecting the salt colored red, oil as yellow or surfactants surrounding the oil- they are very sad, but I’m happy. So how did I do it? by chemical modification I am fabricating membrane with two complete opposing characteristics- comprising of a water loving layer- preventing oil fouling, and liquid repelling layer-preventing wetting. I have achieved over 99% salt rejection- producing clean water of high quality and quantity, and no fouling/wetting of the membrane as can be seen in the right picture – our goal is to supplement the industrial water demand to reduce the burden of clean water supply- because access to clean water is basic human right.