SUMMARY AND CONCLUSION

Naturally, the leaves of Nelumbo nucifera, Colocasia esculenta, and surface of reptiles exhibit water repellent property. They exhibit double-structured roughness, even in submicrometric level. At the molecular level, surface energy affects the liquid-solid interface due to the attraction between them. Repulsive force can be generated between the surface and the water droplet, due to which it forms a spherical shape. Generally, both contact angle and sliding angle measurements are ideal in developing non-wettable surfaces. In the research work carried, Polymers such as PVDF (Poly vinyledene fluoride), PMMA (Poly methyl methacrylate) and PS (Polystyrene) , Silanes such as TEOS (Tetra ethoxyortho silane), MTMS (Methyl trimethoxy silane) and PDMS (Poly dimethoxy silane) were used. The films synthesized were tested for various characterizations. The salient outcomes of the research work are :

- ✓ Non-wettable surfaces have been developed with silane/polymer as composite thin films by sol-gel and spin coating techniques with enhanced surface properties.
- ✓ With FTIR spectra, the spectral bands of the prepared films were determined. Presence of polymer and silane groups were ensured. The

main feature is that beyond 3000 cm^{-1} , there is absence of polar bond – a major criteria to show hydrophobic nature.

- ✓ Thermal studies showed the thermal stability of the films. Silane/PVDF films are more stable. With styrene, small bumps are seen proving the glass transition temperature and their viability .
- ✓ Contact angle measured was in the range between 95° to 153°, confirming the hydrophobicity of the films. Of all, PDMS/PMMA film has higher contact angle with less surface energy and higher surface roughness.
- ✓ Eventhough PDMS/PMMA has higher contact angle, the transparency for this film is lesser. It ranged between 45% to 60%. As the roughness increases, the transparency reduces. To overcome this difficulty , methoxy and ethoxy groups were added.
- ✓ With the ethoxy and methoxy group presence, a stable transmittance range was obtained (i.e) TEOS/MTMS/PVDF, TEOS/MTMS/PMMA and TEOS/MTMS/PS has the transparency range between 80% to 90% with the contact angle of 125°, 119° and 128° respectively.
- ✓ On adding PDMS, superhydrophobic nature was achieved. TEOS/MTMS/PDMS/PVDF, TEOS/MTMS/PDMS/PMMA and TEOS/MTMS/PDMS/PS films has transmittance upto 80% with higher contact angle of 143°,147° and 135°. The films also exhibited higher surface roughness between 47.24µm to 53.64µm.

- ✓ All the sets were proved for self cleaning application. Of all, PDMS/Polymer (PVDF,PMMA and PS) set, MTMS/PDMS/Polymer (PVDF,PMMA and PS) set and TEOS/MTMS/PDMS/Polymer (PVDF,PMMA and PS) set proved for oil-water separation.
- ✓ The methoxy group played the major role in proving oil-water separation application. The coated filter paper was able to separate oil and water.
- ✓ Hydrophobic/Superhydrophobic films has many application. The future scope for these films are they can be tried for anti-corrosive coating, ultra-filtration coatings, anti-reflection coatings, anti-microbial coatings and micro-fluidic devices.

Future Proposal

- ✓ Hydrophobic/Superhydrophobic films has variety of applications. The future scope for these films include anti-corrosive coating, ultra-filtration coatings, anti-reflection coatings, anti-microbial coatings and micro-fluidic devices.
- ✓ Non-wettable films can be developed with other silanes such as HMDS, VTES along with the polymer.
- ✓ With silanes, aerogel , cryogel and xerogel can be developed and it has wide variety of applications.
- ✓ These films can be used in desalination plants, which is one of the most needed facility for the future world.