**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
**SHORT ABSTRACT OF THESIS**

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Thesis Title: Antifouling and Smart Polymeric Ultrafiltration Membranes for Environmental and Biological Separations

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| Name of Thesis Supervisor(s) | : | Prof. M. K. Purkait |
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## SHORT ABSTRACT

The PhD thesis focuses on the synthesis, characterization, and applications of smart polymeric ultrafiltration membranes prepared by using phase inversion method with applications in the field of environment and biological fields. The thesis Chapter 1 discusses about the basics, properties, and problems associated with membranes. Also, the scope and objectives of the present study are reported. The methods to abstain the problem of membrane fouling are also elaborated along with state of the art. Chapter 2 discusses about the different preparation and characterization techniques used in the synthesis and analysis of the membranes. Chapter 3 of the thesis evaluates the role of poly(2-acrylamido-2-methyl-1-propanesulfonic acid) (AMPS) in the modification of polysulfone membranes for ultrafiltration. The modification of the membranes with AMPS results in better hydrophilic and antifouling nature along with improved bovine serum albumin (BSA) removal. Likewise, Chapter 4 evaluate the methoxy poly(ethylene glycol) (mPEG) effect on the hydrophilicity and antifouling nature of the Poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-co-HFP) flat sheet polymeric membranes for humic acid (HA) removal. The study shows positive results of mPEG on the PVDF-co-HFP membrane flux and antifouling profile with better HA removal. Further, Chapter 5 investigates the role of flyash based carbon nanotubes (CNTs) on the hydrophilic and antifouling nature of polysulfone ultrafiltration membranes. The CNTs modified membranes shows better hydrophilicity and antifouling nature. In Chapter 6, $Cu_2O$ photocatalyst modified antifouling polysulfone mixed matrix membrane for ultrafiltration of protein and visible light driven photocatalytic pharmaceutical removal are discussed. The modified membranes shows improved flux profile along with antifouling and photocatalytic nature. The maximum pharmaceutical removal is shown by membrane with highest wt% of $Cu_2O$ photocatalyst under light and acidic conditions. Similarly, Chapter 7 discusses about the stimuli responsive polymer nanocomposite modified mixed matrix polysulfone ultrafiltration membrane for dye removal. The maximum dye removal is observed with modified membranes in light and basic conditions as compared to nascent membrane. Lastly, Chapter 8 presents the conclusion, summary, and scope of future work of the present thesis.