INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Nature-inspired liquid-repellent surfaces, such as superhydrophobic and slippery surfaces, have gained enormous attention because of their potential applications in environmental remediation, anti-corrosion, self-cleaning, bio-medical devices and so on. In the past, several approaches were adopted to develop artificial surfaces with desired wettability. However, significant challenges, such as poor durability and mechanical and chemical robustness, continue to impede its real-world application. This synopsis report outlines the strategic utilization of a facile and catalyst-free 1, 4-conjugate addition reaction between amine and acrylate functional groups for developing liquid-repellent surfaces with enhanced robustness and durability following a simple, scalable, and rapid fabrication approach. The synopsis report entitled “Facile Chemical Approaches to Derive Scalable and Tolerant Liquid Repellent Surfaces" is divided into six chapters. **Chapter 1** gives a concise overview of bio-inspired wettability, general methods adopted to develop artificial anti-wetting surfaces, existing challenges, and objectives behind this thesis work. **Chapter 2** demonstrates the strategic use of a catalyst-free 1,4-conjugate addition reaction between distinct and strategically selected small molecules allowed to prepare an active deposition solution with prolonged shelf-life in various and commonly used reaction media to derive optically transparent superhydrophobic coating. **Chapter 3** introduces a covalent cross-linking chemistry between selected reactants to achieve tolerant and hard superhydrophobicity. **Chapter 4** demonstrates the design of chemically functionalizable coatings with a combination of a physically unclonable porous topography and distinct physiochemical properties (e.g., fluorescence, water wettability, and water adhesion) obtained through orthogonal chemical modifications (i.e., 1,4-conjugate addition reaction and Schiff-base reaction at ambient conditions) for multilevel anti-counterfeiting application. **Chapter 5** accounts for the utilization of a crystalline comb-like polymer to derive a non-fluorinated, substrate-independent, and self-healable amphiphobic solid slippery coating following a simple and scalable fabrication process. **Chapter 6** provides a comprehensive summary of the presented work and a future perspective of this discussed research work.