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**Name of the Scholar: Md Abrar Siddiquee**

**Name of the supervisor: Dr. Rajan Patel**

**Name of the department/Centre: Center for Interdisciplinary Research in Basic Sciences**

**Topic of Research: Studies on the interaction of ionic liquids with antibacterial drugs**

### **Abstract**

Primarily, my research work is focused on surface and physicochemical properties ionic liquids, drugs, ionic liquid-drug conjugates at air water interface. The whole work is based on study of interfacial and physicochemical properties of ionic liquids with drugs by using all interfacial and biophysical techniques. Further, we evaluated the antibacterial activity and cytotoxicity activity of ionic liquid in the absence and presence of drugs. For this purpose we have studied the physicochemical properties and antibacterial activity of different ionic liquids, [C<sub>4</sub>mim][Cl], [C<sub>6</sub>mim][Cl], [C<sub>8</sub>mim][Cl] and [C<sub>10</sub>mim][Cl] with antibacterial drug, levofloxacin, ciprofloxacin and Cloxacillin sodium. The study was performed using surface tension, UV-visible, steady state fluorescence spectroscopy, and cyclic voltammetry (CV) techniques. From this various physiochemical and thermodynamics parameters for ILs and IL-drug mixture have been calculated. The interfacial and thermodynamic parameters like maximum excess concentration ( $\Gamma_{max}$ ) minimum area per molecules ( $A_{min}$ ), Gibbs free energy of micellization ( $\Delta G_m$ ), enthalpy change of micellization ( $\Delta H_m$ ), entropy change of micellization ( $\Delta S_m$ ), and Gibbs excess energy ( $G_{min}^s$ ) for pure ILs and ILs-drug mixtures were determined. The *in-vitro* cytotoxicity of ILs was done using MTT assay on HEK293 (Human embryonic kidney cells). The antibacterial activities of these imidazolium based ILs have been evaluated against *E. coli* and *S. aureus* strain. Further, the effect of these ILs on the antibacterial property of levofloxacin and ciprofloxacin was checked by preparing various combinations of ILs with drug. The results showed the remarkable enhancement in the antibacterial activity of drug with ILs, however, the effect is more prominent with higher alkyl chain length IL.