

Students' Annual Seminar

Tuning the Electro Catalytic Reactions using Li ions: Hydrogen and Ammonia Productions

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Development of methods for economically feasible greener ammonia (NH_3) production is gaining tremendous scientific attention. NH_3 has its importance in fertilizer industry and it is envisaged as a safer liquid hydrogen carrier for futuristic energy resources. Further, tuning the electrode–electrolyte interfaces transiently for controlling the kinetics of hydrogen evolution reaction (HER) on metals will be highly intriguing in reduction reactions such as N_2 reduction. In our study, the inherent HER activities of polycrystalline platinum (Pt) and gold (Au) electrodes are altered by different lithium salts. The HER activity of Pt is suppressed by increasing the Li^+ ion concentration while inverse effect is observed in Au, and this is verified in different pH (2–13) conditions and also with different counter ions [Li^+ , Na^+ , ClO_4^- , Cl^- , and bis (trifluoromethanesulfonyl)imide] ion. Further, it is observed that Li^+ containing aqueous electrolysis based NH_3 production in ambient conditions yields high faradaic efficiency (~12%) NH_3 via nitrogen reduction reaction (NRR) at lower over potentials (~ -0.6V vs. RHE or -1.1V vs. Ag/AgCl). Polycrystalline copper (Cu) and gold (Au) are used as electrodes for electrochemical NRR, where the electrolyte which yields high amount of NH_3 (~41 $\mu\text{mol/L}$) is 5M LiClO_4 in water with Cu as working electrode. Details of the tunability of HER kinetics using Li^+ ions will be discussed during the talk.

Friday, Apr 5th 2019

2:30 PM (Tea/Coffee at 1:30 PM)

Seminar Hall, TIFR-H