INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

In this study a simple carbonization method with optimized process conditions was developed for synthesis of templated carbon. The templated carbons were synthesized using NH_4Y-zeolite and silica gel as inorganic templates. The furfuryl alcohol and sucrose were used as carbon precursors. Doped templated carbons were synthesized using acetonitrile and aniline as nitrogen precursors and nickel acetate tetrahydrate as nickel precursor. The nitrogen and nickel precursors were incorporated along with the carbon precursor. Various characterization techniques were employed to investigate the structural and topographical properties of templates as well as synthesized carbons. The effects of process parameters such as carbonization temperature, dwelling time, heating ramp and flow rate of carrier gas on the development of porous structure and surface area of templated carbons were studied in details. The role of templates and carbon precursors on the physicochemical properties of undoped templated carbons were studied. Carbonization temperature of 750 ^{o}C and dwelling time of 3h were observed to be the optimum conditions for obtaining highest surface area for zeolite templated carbons. For silica gel templated carbons 650 ^{o}C and dwelling time of 3h was observed to be the optimum conditions. The templated carbons were further chemically modified by incorporation of dopants. The nitrogen and nickel were incorporated in templated carbons using different precursors and effects on physicochemical properties were determined. Mesoporous structure of silica gel template facilitated incorporation of dopants compared to that in microporous zeolite template. To prepare nitrogen doped carbon, acetonitrile was observed to be suitable nitrogen precursor compared to aniline. The incorporated dopants acted as the alternate centers for hydrogen activation and further enhanced the hydrogen uptake capacity. For nitrogen doped silica gel templated carbon, maximum hydrogen uptake of 2.45 wt. % was observed at liquid nitrogen temperature and pressure of 8 bar. Higher heat of adsorption was observed for nitrogen doped templated carbon compared to that of undoped templated carbon.