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**Study of Inclusion Complex of Baclofen<sup>®</sup> Analogues with  $\beta$ -Cyclodextrin and Determination of its Stability Constant by UV-Visible Spectroscopy**

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This work reports the interactions of an analogue of baclofen<sup>®</sup> (A-BF) with  $\beta$ -cyclodextrin and the calculation of stability constant (K) of inclusion complex using UV-visible spectroscopy. 0.1 M solutions of a steady concentration of baclofen<sup>®</sup> and varying concentrations of ( $\beta$ -cyclodextrin) were prepared in water. The final  $\beta$ -cyclodextrin solutions concentrations ranged between 0.0 and 0.00019 M. Each solution was examined at 202 nm. Absorbances were recorded and plotted against cyclodextrin concentrations. From the plot, the concentrations of both free and bound baclofen<sup>®</sup> and free  $\beta$ -cyclodextrin were calculated by using the Bensi-Hildebrand method. Then stability constant K was calculated. The magnitude of the stability constant is discussed and the stoichiometry of inclusion complex was determined by means of Job's plot.

**Keywords:**  $\beta$ -Cyclodextrin, Inclusion complex, Baclofen<sup>®</sup> analogues, Alcoholic.

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### **Corrosion Behaviour of Red Mud Particulate Reinforced Aluminium 6013 Composites by Potentiodynamic Polarization**

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Metal matrix composites containing Aluminium 6013 as matrix are getting considerable applications in the automotive, aerospace and other related fields. Ceramic particulates as reinforcement particles in Al-based metal matrix composites will have a great influence on corrosion resistance. This study gives the details of corrosion behaviour of red mud particulate reinforced Aluminium 6013 composites in neutral medium by potentiodynamic polarization techniques using electrochemical work station. Composites are manufactured by stir casting method. Composites of Aluminium 6013 containing red mud particulates with different weight percentage were manufactured. Aluminium 6013 alloy was also casted for comparison. Corrosion rates of composite materials were found to be decreased when compared with that of matrix alloy. Therefore, composite materials are more suitable for application in marine engineering than matrix alloy.

**Keywords:** Aluminium-6013, Red mud, Liquid stir casting method, Vortex.

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**Removal of Metanil Yellow from Aqueous Solution by Batch Sorption on *Caladium bicolour* Corm and Egg Shell: Effect of Nature of Sorbents**

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*Caladium bicolour* is a stubborn weed in farmlands while eggshell biomass is an agricultural waste of no economic importance. Batch sorption of metanil yellow on the biomasses was carried out with a view to determine the effect of nature of sorbents. Effects of initial dye concentration, initial pH and sorbent dosage were investigated. Experimental results were analyzed with three isotherms and three kinetic models. The Boyd model was used to determine the rate-determining step. The *Caladium bicolour* corm contains functional groups while eggshell contains pores. The highest sorption capacities were 3.995 and 1.385 mg/g for *Caladium bicolour* and eggshell, respectively; the optimum pH was 5. Sorption decreased with increase in initial concentration for *Caladium bicolour*, while for eggshell sorption increased with increase in initial concentration. The isotherm and kinetic models applied were good fits. The sorption was controlled by liquid film diffusion. Sorption on *Caladium bicolour* was more than twice that of eggshell. However, the sorptions on both sorbents were low.

**Keywords:** Batch sorption, Eggshell, *Caladium bicolour*, Metanil yellow.

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**Phytochemical Analysis and Ethanolic Extraction of *Gardenia aqualla* Leaves as Corrosion Inhibitor in 1 M H<sub>2</sub>SO<sub>4</sub> Acid**

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The main objective of this study is to investigate the corrosion inhibition properties of *Gardenia aqualla* leaf extract on mild steel using weight loss method. The corrosion of mild steel was investigated at different concentrations of *G. aqualla* and also at different temperatures (303, 313 and 323 K). *G. aqualla* inhibits the corrosion rate of mild steel from 62.4 mm/yr to 6.5mm/yr, 91.6 mm/yr to 16.6 mm/yr and 113.8 mm/yr to 28.4 mm/yr at 303, 313 and 323 K, respectively, which yielded an optimum result in the values of inhibition efficiency from 63.8 to 89.5 %, 52.5 to 81.9 % and 39 to 75 % for the various temperatures after an interval of 3 days after being in contact with its respective environment. The Langmuir isotherm confirmed that physisorption occurred. It was found that inhibition occurred through adsorption of constituents present in the leaf of *G. aqualla* obtained by the phytochemical screening.

**Keywords:** Adsorption, Phytochemical screening, Mild steel, Corrosion inhibition, *Gardenia aqualla*.

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## **Growth and Characterization of Mono-Urea Oxalic Acid Crystals**

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An organic NLO material *viz.*, mono-urea oxalic acid (MUOA) crystal was synthesized and grown as the single crystal by slow evaporation technique using the double distilled water as the solvent. The grown crystal was transparent, colourless and the size of the crystal was about 14 mm × 17 mm × 7 mm obtained within a period of 30 days. The grown crystal was subjected to various studies like XRD, microhardness, linear optical studies, SHG studies and Z-scan studies. The mono-urea oxalic acid crystals crystallize in monoclinic structure with a centrosymmetric space group. This crystal gives out SHG emission even though it is a centrosymmetric crystal. The mechanical parameters like hardness, work hardening coefficient, yield strength and stiffness constant were evaluated. UV-visible spectrum was recorded in the wavelength range of 190-1100 nm to find the linear optical parameters like transmittance, band gap, absorption coefficient and extinction coefficient. Third order NLO studies were carried out by Z-scan technique to find non-linear absorption coefficient, non-linear refractive index and non-linear susceptibility.

**Keywords:** Crystal growth, Single crystal, XRD, NLO, Transmittance, Hardness, Z-scan, Extinction coefficient, Stiffness constant.