



## **SINTESIS NICKEL-ZINC LAYERED HYDROXIDE SALTS (Ni-Zn LHS) SEBAGAI ADSORBEN INDIGOSOL VIOLET**

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### **INTISARI**

Telah dilakukan kajian sintesis Garam Hidroksida Terlapis Nikel-Seng (Ni-Zn LHS) dan aplikasinya sebagai adsorben zat warna indigosol violet. Sintesis adsorben Ni-Zn LHS dilakukan dengan metode kopresipitasi dan *grinding* pada variasi rasio mol OH dan total Ni-Zn sebesar 0,3; 0,6 dan 0,9. Pada setiap percobaan, rasio mol Ni dan Zn adalah 2:1. Adsorben hasil sintesis dikarakterisasi dengan XRD, FTIR dan SEM. Pengaruh beberapa kondisi adsorpsi yakni pH, waktu kontak dan konsentrasi awal larutan dipelajari pada penelitian ini.

Analisis XRD menunjukkan bahwa rasio mol OH:total Ni-Zn 0,3 untuk metode kopresipitasi dan 0,6 untuk metode *grinding* menghasilkan Ni-Zn LHS yang paling murni yang ditandai dengan munculnya empat puncak karakteristik untuk Ni-Zn LHS pada  $2\theta$   $9^\circ$ ;  $19^\circ$ ;  $33^\circ$  dan  $59^\circ$ . Karakterisasi dengan spektrofotometer FTIR diperoleh empat puncak utama pada 3460, 1628, 1381 dan  $632\text{ cm}^{-1}$  berturut-turut menunjukkan adanya vibrasi rentangan O-H, vibrasi tekukan H-O-H, vibrasi rentangan O-NO<sub>2</sub> dan vibrasi tekukan M-O-H. Hasil penelitian menunjukkan bahwa kondisi optimum adsorpsi indigosol violet oleh Ni-Zn LHS kopresipitasi dan *grinding* diperoleh pada pH 5 dan waktu kontak 120 menit. Kenaikan persen massa unsur karbon dalam analisis SEM-EDS setelah adsorpsi membuktikan bahwa indigosol violet terserap dengan baik pada permukaan Ni-Zn LHS. Adsorpsi pada kedua adsorben mengikuti model kinetika pseudo orde kedua Ho dengan konstanta laju adsorpsi ( $k_2$ ) untuk Ni-Zn LHS kopresipitasi sebesar  $5192\text{ g mol}^{-1}\text{ min}^{-1}$  dan Ni-Zn LHS *grinding* sebesar  $6416\text{ g mol}^{-1}\text{ min}^{-1}$ . Adsorpsi pada kedua adsorben mengikuti model isoterm Freundlich dengan  $K_F$  untuk Ni-Zn LHS kopresipitasi sebesar  $0,13\text{ mol g}^{-1}$  dan Ni-Zn LHS *grinding* sebesar  $2,02\text{ mol g}^{-1}$ .

Kata kunci: Ni-Zn LHS, kopresipitasi, *grinding*, adsorpsi, indigosol violet



## **SYNTHESIS OF NICKEL-ZINC LAYERED HYDROXIDE SALTS (Ni-Zn LHS) AS ADSORBENT OF INDIGOSOL VIOLET**

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### **ABSTRACT**

Synthesis of Nickel-Zinc Layered Hydroxide Salts (Ni-Zn LHS) and its application as adsorbent of indigosol violet dye had been studied. Ni-Zn LHS were synthesized by co-precipitation and grinding method at mole ratio of OH and total Ni-Zn equal to 0.3, 0.6 and 0.9. In all experiments, the mole ratio of Ni and Zn was 2:1. The synthesized adsorbents were characterized using FTIR, XRD and SEM. Effect of various adsorption conditions such as pH, contact time and initial concentration of dye had been studied.

XRD pattern showed the mole ratio of OH:total Ni-Zn 0.3 for co-precipitation method and 0.6 for grinding method yielded the most pure Ni-Zn LHS as shown by the appearance of four characteristic peaks for Ni-Zn LHS at  $2\theta$   $9^\circ$ ;  $19^\circ$ ;  $33^\circ$  and  $59^\circ$ . Characterization using FTIR spectrophotometer showed four main peaks at 3460, 1628, 1381 and  $632\text{ cm}^{-1}$  which indicated the presence of stretching vibration of O-H, bending vibration of H-O-H, stretching vibration of O-NO<sub>2</sub> and bending vibration of M-O-H, respectively. The adsorption experiment showed that the optimum adsorption of indigosol dye on Ni-Zn LHS obtained by co-precipitation and grinding methods were at pH 5 and contact time 120 minutes. The increasing of carbon mass percentage in SEM-EDS analysis after adsorption proved that indigosol violet was adsorbed onto LHS. The adsorption of both adsorbents fitted the Ho pseudo second order model with adsorption rate constant ( $k_2$ ) for Ni-Zn LHS co-precipitation was  $5192\text{ g mol}^{-1}\text{ min}^{-1}$  and that for Ni-Zn LHS grinding was  $6416\text{ g mol}^{-1}\text{ min}^{-1}$ . Both adsorptions fitted Freundlich isotherm model with  $K_F$  value for Ni-Zn LHS co-precipitation was  $0.13\text{ mol g}^{-1}$  and that for Ni-Zn LHS grinding was  $2.02\text{ mol g}^{-1}$ .

Keywords: Ni-Zn LHS, co-precipitation, grinding, adsorption, indigosol violet