

## ABSTRAK

Berkembangnya industri baterai litium ion menyebabkan permintaan global akan litium juga mengalami kenaikan. Termasuk Indonesia, dalam beberapa tahun terakhir Indonesia rutin melakukan impor litium dari China, Vietnam, dan Korea. Sebagai alternatif, telah dilakukan eksplorasi kandungan litium lokal salah satunya berupa *brine water* panas bumi Tirtasanita, Jawa Barat. Metode adsorpsi menggunakan material pertukaran ion anorganik oksida mangan hidrat tipe spinel sebagai adsorben yang menunjukkan selektivitas tinggi terhadap ion litium. Material adsorben disintesis dari  $\text{MnO}_2$  dan  $\text{LiOH}$  melalui metode reaksi padat-padat dengan variasi preparasi dan temperatur *sintering* 750, 800, dan 850 °C. Produk sintesis terbaik digunakan sebagai adsorben pada adsorpsi litium dari *brine water* Tirtasanita hasil pemekatan rumah prisma dengan temperatur 30, 40, 50, 60, dan 70 °C dalam interval 60 menit selama 5 jam. Hasil penelitian ini diketahui bahwa material yang disintesis dengan preparasi dekomposisi termal dan *sintering* 850 °C memiliki kristalinitas Li-Mn-O spinel paling baik, dan memiliki kapasitas adsorpsi 7,6178 mg litium/g adsorben. Pada pengaruh temperatur, diketahui bahwa pada temperatur 30 °C terjadi adsorpsi fisik dengan litium maksimal yang teradsorpsi sebesar 109,933 mg/L. Pada 40 dan 50 °C terjadi adsorpsi kimia dengan adsorpsi maksimal 107,772 mg/L dan 107,925 mg/L serta diatas 50 °C adsorpsi cenderung mengalami penurunan karena pemutusan ikatan pada kisi tetrahedral. Berdasarkan pemodelan kinetika adsorpsi *pseudo-first order* dan *pseudo-second order* didapatkan bahwa pengendali laju pada proses ini merupakan reaksi kimia.

Kata Kunci: Litium, Spinel, Reaksi padat-padat, *Brine water*, Adsorpsi.

## ABSTRACT

The development of the lithium ion battery industry has caused global demand for lithium to also increase. Including Indonesia, in recent years Indonesia routinely imports lithium from China, Vietnam and Korea. As an alternative, local lithium sources exploration has been carried out, one of which is Tirtasanita geothermal brine water, West Java. The adsorption method uses an inorganic ion exchange material like spinel-type manganese oxide as an adsorbent which shows high selectivity to lithium ions. The adsorbent material was synthesized from  $\text{MnO}_2$  and  $\text{LiOH}$  via solid-state reaction method with various preparations and sintering temperatures of 750, 800, and 850 °C. The best synthesis product is used as an adsorbent on the adsorption of lithium from Tirtasanita brine water at temperatures of 30, 40, 50, 60, and 70 °C at intervals of 60 minutes for 5 hours. The results of this study note that the material synthesized with the preparation of thermal decomposition and 850 °C sintering has the best crystallinity of Li-Mn-O spinel, and has an adsorption capacity of 7.6178 mg lithium/g adsorbent. On the influence of temperature, it is known that at a temperature of 30 °C physical adsorption occurs with a maximum lithium adsorbed at 109.933 mg/L. At 40 and 50 °C chemical adsorption occurs with a maximum adsorption of 107.772 mg/L and 107.925 mg/L and above 50 °C adsorption tends to decrease due to the breaking of bonds in the tetrahedral lattice. Based on the pseudo-first order and pseudo-second order adsorption modeling, it is found that the rate control in this process is a chemical reaction.

Keywords: Lithium, Spinel, Solid-state reactions, Brine water, Adsorption.