ABSTRAK

Ekstraksi Lithium dari Brine Geotermal PT Pertamina Geothermal Energy Tbk. sebagai Bahan Baku Pembuatan Baterai Lithium

(Bogie Lesmana, 2025, 65 Halaman, 10 Tabel, 17 Gambar, 4 Lampiran)

Permintaaan *lithium* meningkat seiring pertumbuhan industri kendaraan listrik dan kebutuhan energi bersih. Salah satu sumber *lithium* alternatif adalah *brine* geotermal, yaitu limbah cair dari proses pembangkitan listrik panas bumi. Penelitian ini bertujuan untuk mengekstraksi lithium dari *brine* geotherma*l* PT Pertamina *Geothermal Energy* Tbk. Lumut Balai menggunakan metode presipitasi kimia, serta menguji potensi hasil ekstraksi sebagai bahan baku baterai *lithium.* Tahapan proses meliputi: penghilangan ion pengotor (B, Si, Mg, Ca), presipitasi *lithium* dengan natrium karbonat (Na_2CO_3) pada suhu 80°C dan pH 11, serta analisis hasil menggunakan *X-Ray Fluorescence* (XRF). Variasi rasio reagen (1:5; 1:10; 1:15) dan waktu presipitasi (15–75 menit) digunakan untuk menentukan kondisi optimum. Hasil presipitasi berupa *lithium* karbonat (Li_2CO_3) dimanfaatkan untuk pembuatan baterai *lithium* sederhana dengan elektrolit LiCl 1M, dan diuji performanya melalui pengukuran tegangan, arus, dan daya. Hasil menunjukkan kadar *lithium* tertinggi sebesar 28,9 ppm dengan yield 129,08% pada rasio 1:15 dan waktu 60 menit. Baterai berbasis hasil ekstraksi menghasilkan tegangan hingga 3,979 V dan mampu menyalakan LED serta kipas mini. Penelitian ini membuktikan bahwa *brine* geotermal berpotensi sebagai sumber lithium yang efisien dan aplikatif, serta mendukung pengembangan energi terbarukan dan industri baterai di Indonesia.

Kata Kunci: *Lithium, Brine Geoterm*al, Presipitasi Kimia, Baterai *Lithium*, Na_2CO_3

ABSTRACT

Lithium Extraction from Geothermal Brine of PT Pertamina Geothermal Energy Tbk. as a Raw Material for Lithium Battery Production

(Bogie Lesmana, 2025, 65 *Pages,* 10 *Table,* 17 *Figures,* 4 *Appendix)*

The demand for lithium continues to rise due to the rapid growth of the electric vehicle industry and the need for clean energy. One promising alternative lithium source is geothermal brine, a by-product of geothermal power generation. This study aims to extract lithium from geothermal brine sourced from PT Pertamina Geothermal Energy Tbk., Lumut Balai, using chemical precipitation, and to evaluate the potential application of the extracted lithium as a raw material for lithium-based batteries. The process involved three main steps: removal of interfering ions (B, Si, Mg, Ca), lithium precipitation using sodium carbonate (Na_2CO_3) at 80°C and pH 11, and product analysis via X-Ray Fluorescence (XRF). Variations in reagent-to-brine ratios (1:5; 1:10; 1:15) and precipitation time (15–75 minutes) were tested to determine optimal conditions. The resulting lithium carbonate (Li_2CO_3) was then utilized to produce simple lithium batteries using 1M LiCl electrolyte, followed by performance tests measuring voltage, current, and power output. The results showed the highest lithium concentration of 28.9 ppm and a yield of 129.08% at a 1:15 ratio with 60 minutes of reaction time. The battery made from the extracted lithium achieved a maximum voltage of 3.979 V and successfully powered LED lights and a mini fan. This study confirms the potential of geothermal brine as an efficient and viable lithium source, supporting renewable energy development and battery industry growth in Indonesia.

Kata Kunci: *Lithium, Geothermal Brine, Chemical Precipitation, Lithium Battery, Sodium Carbonate*