

**PEMISAHAN DAN KARAKTERISASI SPESI LANTHANUM  
PADA ABU TERBANG BATUBARA MENGGUNAKAN  
METODE PENGENDAPAN BERTINGKAT**

**SKRIPSI**

Diajukan untuk memenuhi syarat memperoleh gelar Sarjana Sains  
program studi kimia



Oleh:

Shafira Azzahra Maharani

2007920

**PROGRAM STUDI KIMIA  
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU  
PENGETAHUAN ALAM  
UNIVERSITAS PENDIDIKAN INDONESIA  
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**PEMISAHAN DAN KARAKTERISASI SPESI LANTHANUM PADA ABU  
TERBANG BATUBARA MENGGUNAKAN METODE PENGENDAPAN  
BERTINGKAT**

Oleh  
Shafira Azzahra Maharani  
2007920

Skripsi ini diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana  
Sains pada Program Studi Kimia Fakultas Pendidikan Matematika dan Ilmu  
Pengetahuan Alam

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**PEMISAHAN DAN KARAKTERISASI SPESI LANTHANUM PADA ABU  
TERBANG BARUBARA MENGGUNAKAN METODE PENGENDAPAN  
BERTINGKAT**

Oleh:

Shafira Azzahra Maharani

2007920

Disetujui dan disahkan oleh,

Pembimbing I

*sec.*  


(Dr. Galuh Yuliani, M.Si.)

NIP.198007252001122001

Pembimbing II



(Dr. H. Budiman Anwar, M.Si.)

NIP.197003131997031004

Mengetahui,

Ketua Program Studi Kimia



(Prof. Fitri Khoerunnisa, Ph.D.)

NIP.197806282001122001

## **PERNYATAAN**

Dengan ini saya menyatakan bahwa skripsi dengan judul “Pemisahan dan Karakterisasi Spesi Lanthanum pada Abu Terbang Batubara Menggunakan Metode Pengendapan Bertingkat” ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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Pembuat pernyataan

Shafira Azzahra Maharani

## ABSTRAK

Abu terbang atau *fly ash* (FA) merupakan limbah hasil pembakaran batubara yang banyak mengandung logam-logam berharga, tetapi hingga saat ini belum bisa dimanfaatkan secara optimal. Salah satu logam berharga yang terkandung dalam FA adalah lanthanum. Lanthanum merupakan golongan logam tanah jarang (LTJ) yang banyak digunakan pada pembuatan baterai, lensa, proyektor, film sinar-X, dan sebagai katalis. Penelitian ini bertujuan untuk memisahkan dan mengkarakterisasi spesi lanthanum pada abu terbang batubara. Analisis awal *X-Ray Fluorescence* (XRF) pada sampel FA menunjukkan adanya potensi logam tanah jarang yang berikatan dengan unsur lainnya sebesar 13,2%. Metode pemisahan lanthanum yang digunakan dalam penelitian ini meliputi pelindian alkali dan asam untuk meningkatkan pemulihan logam tanah jarang serta pengendapan bertingkat untuk memisahkan spesi lanthanum dari abu terbang batubara. Lanthanum dikarakterisasi menggunakan *X-Ray Diffraction* (XRD) dan *Fourier Transform Infrared* (FTIR). Berdasarkan analisis XRD, diperoleh bahwa hasil pelindian alkali menunjukkan munculnya pola difraksi untuk mineral kuarsa, mullit, dan sodalit, sedangkan hasil pelindian asam menunjukkan hilangnya pola difraksi mineral-mineral tersebut dan munculnya pola difraksi lain berupa spesi lanthanum. Hasil pemisahan lanthanum menunjukkan pola difraksi spesi lanthanum yang berkesesuaian dengan puncak pada  $2\theta$  28,76°, 34,18°, 47,22°, 50,90°, 71,92°, dan 84,84°. Analisis FTIR juga menunjukkan keberadaan vibrasi ulur La–O pada pita serapan 679,70  $\text{cm}^{-1}$ . Dengan demikian, pemisahan spesi lanthanum pada abu terbang batubara menggunakan metode pengendapan bertingkat menghasilkan produk berwarna putih yang diduga berupa spesi lanthanum oksida.

**Kata kunci:** lanthanum, LTJ, abu terbang, pengendapan bertingkat

## ABSTRACT

*Fly ash (FA) is a waste from coal combustion that contains many valuable metals, but until now it has not been optimally utilized. One of the valuable metals contained in FA is lanthanum. Lanthanum is a class of rare earth metals (LRE) that are widely used in the manufacture of batteries, lenses, projectors, X-ray films, and as catalysts. This study aims to separate and characterize lanthanum species in coal fly ash. Preliminary X-Ray Fluorescence (XRF) analysis of FA samples showed the potential of rare earth metals that bind to other elements by 13.2%. The lanthanum separation methods used in this study include alkaline and acid leaching to enhance the recovery of rare earth metals and multistage precipitation to separate lanthanum species from coal fly ash. Lanthanum was characterized using X-Ray Diffraction (XRD) and Fourier Transform Infrared (FTIR). Based on XRD analysis, it was found that the alkaline leaching results showed the appearance of diffraction patterns for quartz, mullite, and sodalite minerals, while the acid leaching results showed the disappearance of the diffraction patterns of these minerals and the appearance of other diffraction patterns in the form of lanthanum species. The lanthanum separation results showed diffraction patterns of lanthanum species corresponding to peaks at  $2\theta$  28.76°, 34.18°, 47.22°, 50.90°, 71.92°, and 84.84°. FTIR analysis also showed the presence of La-O stretching vibrations in the 679.70  $\text{cm}^{-1}$  absorption band. Thus, the separation of lanthanum species in coal fly ash using the multistage precipitation method produces a white product that is thought to be lanthanum oxide species.*

**Keywords:** *lanthanum, REEs, fly ash, multistage precipitation*

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**PEMISAHAN DAN KARAKTERISASI SPESI LANTHANUM PADA ABU TERBANG BATUBARA MENGGUNAKAN METODE PENGENDAPAN BERTINGKAT**

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