# REMOVAL OF ORGANIC SULFUR FROM COAL BY USING PEROXYACETIC ACID WITH AN ULTRASONIC-ASSISTED EXTRACTION SYSTEM

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## ABSTRACT

### REMOVAL OF ORGANIC SULFUR FROM COAL BY USING PEROXYACETIC ACID WITH AN ULTRASONIC-ASSISTED EXTRACTION SYSTEM

Coal desulfurization is important for producing clean coal and minimising hazardous pollutants during combustion. However, organic sulfur in coal is more difficult to remove than inorganic sulfur. Therefore, in this study, a method of Jambi coal sample desulfurization using peroxyacetic acid (PAA) with ultrasonic assisted extraction system was proposed, and experimental investigation was carried out. The influences of concentration of PAA, temperature and time on desulfurization effect were studied and the corresponding optimal value were determined by using response surface methodology (RSM). These desulfurization effect were studies and PAA are capable to reducing the organic sulfur by 35.20%. Besides that, a validated run for optimised to confirm the parameters under suggested optimal conditions process parameters at 70:30, 30°C and 10 min, indicated that the resulted in 0.47% of organic sulfur removal. This experimental showed the actual organic sulfur removal 0.47% is slightly closer resulted to predicted at 0% with the significant standard deviation of 3.52841. PAA has the advantages of good desulfurization effect especially organic sulfur due to PAA is a mild oxidising agent in coal desulfurization. In generally, PAA with ultrasonic-assisted extraction system method have potentially to remove organic sulfur in coal.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Background of study

Coal is a fossil fuel formed from dead plant that has been consolidated between rock by the combined effects of pressure and heat. The energy from coal is derived from the energy absorbed by plants from the sun over millions of years ago. The chemical composition content in coal is include carbon, hydrogen, oxygen, nitrogen, and sulfur (Shapely et.al.,2011).

The common utilization of coal is as an energy source, however there are number of issues related with this utilization of coal. This is because the emission of combustion coal contains ash and gases of sulfur mainly sulfur dioxide and sulfur trioxide, which is not clean fuel to environment ecosystem. Sulfur dioxides are serious pollutants that endanger both the ecology and human health. Generally there are two types of sulfur found in coal which are organic sulfur and inorganic sulfur, where organic sulfur is difficult to remove than inorganic sulfur. Hence, the pre-treatment process of coal has to be effective to remove both inorganic (pyrite) and organic sulfur form. Physical cleaning methods are not effective in removing organic sulfur because organic sulfur is chemically bonded. Hence, chemical cleaning method is the most effective coal desulfurization method due to its ability in removing almost all organic and inorganic sulfur compared to the physical method (Dhawan & Sharma, 2019).