UNIVERSITI TEKNOLOGI MARA

MOISTURE FORMATION OF UREA MAGNESIUM SULPHATE SYNTHESIZED VIA BALL MILLING

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ABSTRACT

Higher population urge agricultural family to rise up their production in food source along with maintaining the growth of the plant as well. In order to improve nutrient in the soil so that the plant able to growth well, mechanochemical method was practiced as to synthesis of Urea Magnesium Sulphate (UMS). The UMS was synthesized based on different ratio and milling time via ball milling and the moisture content is investigated on the sample. The synthesizing is conducted based on ratio 1:1, 2:1, 1:0.7 and 1:2 of magnesium sulphate to urea with different time milling of 2, 4 and 8 minutes. The characterization of UMS is analyze by using X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) is to determine the functional group of UMS and Thermal Gravimetric Analysis (TGA) is used to identify the moisture formation in UMS. It was found that most of the sample crystallized based on XRD graph pattern. The analysis found that urea magnesium sulphate with ratio of 1:2 at 8 minutes milling time has synthesized urea magnesium sulphate. While based on the FTIR the range of IR Spectrometry adsorption between 515cm1 to 4000cm-1 and it is shown that the most of the bond is found and similar with each other in the sample. To study proximate analysis, TGA is used as to identify the moisture content which is in between 800C to 1500C. High amount of magnesium sulphate and longest milling time has the lowest amount of moisture content. As to ensure the urea magnesium sulphate is synthesized with low moisture content, the milling time should be conducted with longer period.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Urea is well known in preferred fertilizer uses for soil and leaf fertilization because the content in urea itself involve with contribution in supplying nutrient to soil which is nitrogen, phosphorus and potassium. Urea has highest amount of nitrogen content in solid fertilizer either prills or granules which is 46% makes urea to produce, transport and deliver to the farm (Templeman, January 1961).

The high solubility of urea in water supports the suitability as fertilizer solution such as foliar feed. Urea act as natural excretory product towards the organism in the sea and the nitrogenous compound is absorbed by marine plankton (Gillespie, 2018). Nitrate concentration helps in growth of plant due to the absorption of the nutrient is begins at the root surface which resulting in the diffused out of the pressure inside the roots.

The history of urea is origins from Rouelle first discovery in 1773. He found urea as a major organic compound which excreted by kidney releasing urine. After development of ammonia (NH_3) process, the production of urea is now synthesis from the NH_3 liquid and CO_2 gas (Saffran, 1999).

The reactions are as follow:

$$2NH_3 + CO_2 \leftrightharpoons {}_4COONH_2 + Heat \qquad \text{(i)}$$

- Ammonia and carbon dioxide react to form ammonium carbamate as an intermediate in first reaction.

$$NH_4COONH_2 \leftrightharpoons NH_2CONH_2 + H_2O - Heat \qquad \text{(ii)}$$