UTILIZATION OF SULFUR SLUDGE RESULTS FROM MANUFACTURING OF SULFURIC ACID

Submitted By

Moustafa Youssef Mohamed Youssef

B.Sc. of Science (Chemistry/ Physics), Faculty of Science, Fayoum University, 2006

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

2018

APPROVAL SHEET

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This thesis Towards a Master Degree in Environmental Science

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M. Youssef

ABSTRACT

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During sulfuric acid manufacturing, huge quantity of wastes is being generated and causes major environmental problems for their storage and disposal. On the other hand, fertilizer industry is an important industry for assessing the plant requirements. But this industry faces a serious problem of fertilizer product stabilization under the handling and storage conditions. Therefore, in this study attempts were made for solving these problems; these attempts were achieved by using sulfur sludge wastes as conditioner; sulfur sludge is internal conditioner A number of compound fertilizer (NPK fertilizer) formulations based on sulfur sludge as a filler have been prepared. The main physico-chemical properties of the prepared formulations, such as chemical composition, granulometric composition and crushing strength of granules were examined by standard methods. A comparative study with the other fertilizer formulations that containing phosphogypsum filler, bentonite clay filler and containing no fillers was done. The results showed that the prepared formulations using sulfur sludge as filler exhibited improvement in NPK fertilizers quality which notified in terms of physical and chemical characteristics compared with the reference NPK fertilizers (containing no fillers) and those containing phosphogypsum filler and bentonite clay filler. This improvement in NPK fertilizers quality is considered an evidence of the positive effect of sulfur sludge waste on the NPK fertilizers industry hand-in-hand with the environmental protection and the plant nutrition.

On the other hand, filtering of molten sulfur in sulfuric acid manufacturing is required to remove solids that may plug sulfur spray nozzles or accumulate in catalyst beds that increasing the pressure drop and decreasing operating durations, this filtration works efficiently only after using filter aid and initial deposits have been trapped in the medium. Filter aid generally, consists of two materials, the first one works as a filler material and another one works as a colloidal material.in this

study attempts were achieved by using sulfur sludge wastes after treatments of this sludge by concentrated sulfuric acid as a filler in manufacturing of filter aid. A comparative study with the other filter aid such as Kessel Gohar diatomite (global product) and ABU ZAABLE 12 “AB12” (local product). Results showed that the prepared filter aid using sulfur sludge as filler decreases the ash content in filtrated sulfur than Kessel Gohar diatomite and AB12 with ratio of about 35.8% and 65% respectively, and thus result in increasing the operating durations due to decreasing the amount of ashes deposited in the catalyst beds comparing with filter aids of Kessel Gohar diatomite and AB12 with ratio of about 36.4% and 65.5% respectively. .On other hand sulfur sludge filter aid also improves filter operating duration than Kessel Gohar diatomite and AB12 with ratio of about -1.7% and 46.3% respectively. Finally sulfur sludge filler in manufacturing of filter aid can be used as a reusable material without any change on the ashes in filtrated sulfur and filter operating duration.

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