**COVER LETTER**

 June 10th 2021

Novi Sylvia

Department of Chemical Engineering, Faculty of Science, University of Malikussaleh

Bukit Indah, Lhokseumawe, Aceh, Indonesia

Dear Editor of Indonesian Journal of Chemistry,

I wish to submit an original research article entitled “**CO2 Adsorption at Fix Bed Column Using Bottom Ash Waste from Palm Oil Plant Boiler Burning Process**” for consideration by the Indonesian Journal of Chemistry.

I confirm that the written manuscript is original, and no part of it has been published before, nor is any part of it currently under consideration for publication elsewhere.

This manuscript describes the handling of emissions, especially CO2 in palm oil mills. Palm oil is the largest export commodity in Indonesia. Naturally, the country owned numerous palm oil mill (POM) industry, both government and privately-owned. The palm oil mill (POM) produces waste in the form of a palm shell and fiber as a by-product of the mill. Most POMs use fiber and shell as fuel for boilers. In a POM, boiler is the heart of the industry. It plays both as source of energy and steam that will be used to process palm oil. Fiber and shell used as boiler are solid and contains carbon which later can be converted as a source of heat energy by thermal reaction of the carbon conten. Burning fiber and Shell can produce heat energy, but, on the other hand, it also produces greenhouse gas (GHG) emissions so it is necessary to do research to reduce the GHGs produced in burning of this biomass. Additionally, this research is also in line with Presidential Regulation to reduce greenhouse gases in 2010. Later in 2020, government will be targeting GHG reduction in the energy and transportation sectors. The two sectors, which contribute greatly to greenhouse gas emissions and is predicted to continuesly increase in line with population and industrial growth, one of which is the palm oil industry. More than 75% of GHG composition in the atmosphere is CO2. Currently, CO2 concentration has risen from 280 ppm in pre-industrial period to be 400 ppm. Meanwhile, the recommended limit is 350 ppm. Therefore if CO2 contribution in diverse activities is significantly reduced, then the global warming effect to climate change will be decreased.

Until now, adsorption method since preferable to absorption method due to adsorption is more economics, able to remove organic materials and no poisonous side effect occurred [15]. Adsorption method is also considered as a promising alternative to adsorb CO2, considering its relatively not expensive, simpler process and no liquid waste produced. Biomass and waste based adsorbent materials are usually more preferable to commercial adsorbent, namely solid waster from palm oil plant which are palm shell and husk**.** Many plants utilize shell and husk as fuel to boiler producing steam. Palm shell and husk burning liberates ash that is left at the furnace as solid granules or crust that is usually called as bottom ash. Bottom ash basically contains (SiO2) and Alumunium (Al2O3), which is the basic content of zeolite. Zeolite has adsorption selectivity CO2/N2 5 to 10 times higher than carbon based adsorbent. By the reason of bottom ash has the same content with zeolite thus is able to adsorb CO2. Studies on bottom ash-based adsorbent have been done to adsorb heavy metal, but CO2 adsorption studies have not been widely spread in literature. Currently the utilization of bottom ash is not maximized and well managed yet. Bottom ash is also an issue in palm oil industry since its necessity on large area and its steady increasing amount. Considering the above concern, this research is aimed to study the characteristics and capability of bottom ash from palm oil industry burning in boiler as adsorbent to adsorb CO2. Adsorption is conducted at applied column.

**This manuscript is very suitable to be published in the Indonesian Journal of Chemistry and has relevance with basic and applied chemistry, especially in the field of Environmental Chemistry.**

Please find below a list of potential reviewers for this work. I have no conflicts of interest to disclose. Please address all correspondence concerning this manuscript to me at **novi.sylvia@unimal.ac.id**

Your consideration is very much appreciated. We are looking forward to your favorable reply.

Sincerely,

[Novi Sylvia]

**List of Potential Reviewers**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | **Name** | **:** | **Prof. Husni Husin** |
|  | Affiliation | : | **Department of Chemical Engineering, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia** |
|  | Address | : | Banda Aceh |
|  | E-mail | : | husni\_husin@che.unsyiah.ac.id |
|  | Reviewing Interest / Expertise | : | Catalyst, biodiesel, chemical engineering process |

|  |  |  |  |
| --- | --- | --- | --- |
| 2. | **Name** | **:** | **DR. Ir. Azhari, M. Sc** |
|  | Affiliation | : | Department of Chemical Engineering, Faculty of Science, University of Malikussaleh |
|  | Address | : | Bukit Indah, Lhokseumawe, Aceh, Indonesia |
|  | E-mail | : | **azhari**@**unimal**.ac.id |
|  | Reviewing Interest / Expertise | : | Biodiesel, chemical engineering process |

|  |  |  |  |
| --- | --- | --- | --- |
| 3. | **Name** | **:** | **Dr. Ir. Yunardi, M. AsC** |
|  | Affiliation | : | **Department of Chemical Engineering, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia** |
|  | Address | : | Banda Aceh |
|  | E-mail | : | yunardi@unsyiah.ac.id |
|  | Reviewing Interest / Expertise | : | chemical engineering process, simulation and modelling. |

|  |  |  |  |
| --- | --- | --- | --- |
| 4. | **Name** | **:** | **Prof. Abrar Muslim** |
|  | Affiliation | : | **Department of Chemical Engineering, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia** |
|  | Address | : | Banda Aceh |
|  | E-mail | : | abrar.muslim@]unsyiah.ac.id |
|  | Reviewing Interest / Expertise | : | Adsorption, chemical engineering process, simulation and modelling. |