



# DIGEST

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## Oil-based Ink from Biochar of Used Mashaf Via Microwave Technique: A Waste Circularity Option in Quran Printing Industry



**Biochar of Used Mashaf obtained under Microwave Pyrolysis**



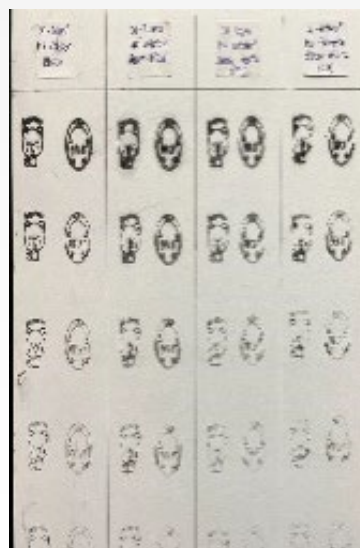
**Oil-based ink**

Current calls by the United Nations through the Sustainable Development Goals aim to reduce the negative environmental impact of cities by 2030, particularly in air quality and waste management. Malaysia, too, faces challenges in the aspect of managing waste; the greenhouse gas emissions from its daily activities generate waste. Reducing waste in landfills by providing emerging technology is important.

In the aspect of disposing of particular materials such as used Mashaf, special care must be taken to maintain holiness as prescribed by the Fatwa Committee in the National Council for Islamic Religious Affairs in Malaysia.

This used Mashaf, which is not in good condition to read because of damage, torn out, scribbled, etc., will be incinerated, and its ash shall be disposed of according to the prescribed method. With the increase of enrolment in Quran users and consumers, especially the Tahfiz students, there is a need for technology that could solve the problem while at the same time improving environmental sustainability through waste circularity.

Our lab has carried out investigations to resolve the issues that lead to waste circularity. We convert the used Mashaf into biochar, which is then used to replace carbon black in the ink formulation. The ink could be used for printing Al-Quran, which indeed can ensure the waste circularity is maintained within the use of making Al-Quran. The used Mashaf was subjected to a thermal decomposition process using a microwave technique to obtain the biochar. Contaminant removal was carried out on the biochar using different chemicals, followed by formulating the oil-based ink. The treated Quran biochar was examined using X-ray fluorescence and elemental analysis. The ink was further studied for oil-based ink formulation with a standard carbon black ink formulation for printing. The biochar, which contains impurities like  $\text{TiO}_2$ ,  $\text{SiO}_2$ , and  $\text{CaO}$ , has been used as a carbon black substitute in printing ink. An acid digestion method has been used to remove contaminants, resulting in higher  $\text{TiO}_2$  and  $\text{SiO}_2$  levels and reduced  $\text{CaO}$ . The ink from untreated used Mashaf biochar is practical, as it preserves the ideal particle size. Microwave pyrolysis of wastepaper, particularly mashaf Quran, has been explored as a sustainable waste management solution in Malaysia.



**Stamping method on standard A4 paper 60 gsm**



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