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New Approach of *Samak* Clay Usage for *Halal* Industry Requirement

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Abstract

Halal food, pharmaceutical, cosmetic and personal care products are considered *najis* if they are either contaminated or are in direct contact with *najis al-mughallazah* (extreme *najis*). Cleansing of extreme *najis* require the use of *samak* clay or soil. Thus, in compliance with the *halal* industry requirements, a study of *samak* clay as the potential industrial *Islamic* cleansing application was conducted. Heavy metal contaminants and clay properties such as pH, particle size distribution (PSD) and moisture content were determined. The study on the clay properties of *samak* will be able to facilitate the acceptance of it in the area of *Islamic* cleansing of extreme *najis* throughout the *halal* supply chain of foods, pharmaceutical, cosmetics and other *halal* industries. This new approach of *samak* clay usage is commercially viable for those related halal industries as it is conveniently and economically produced. *Samak* clay as a commercial product that meets the standard *halal* requirements of quality and safety will further enhance consumer confidence.

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Keywords: *Halal*; Clay; Industrial *Islamic* Cleansing; *najis*; *samak*

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1. Introduction

Currently, the industry needs of *halal* certification are increasing in demand, worldwide. The market of halal foods is set to grow rapidly year on year. *Halal* is an Arabic word, means permissible or lawful for consumption and use by Muslims whereas *haram* is anything that is unlawful or forbidden (Al-Qaradawi, 2001). The word *toyyib* means it must meet the quality, safety and wholesomeness (Che Man *et al*., 2005). In the Holy Quran (Surah Al Mā-idah 5:88), *Allah* commands Muslims and all mankind to eat and live on *halal* and *toyyib* products (Din-Al-Hafiz, 2008). As such, *halal* does not only cover religious aspect but at the same time adhere strictly to the compliance of its quality and hygiene in the production of foods and drinks as well as other consumer products. This *Islamic* practice is similar to the Jewish religion, whereby kosher dietary laws determine the appropriate feeding practices for the Jews (Regenstein *et al*., 2003). Kosher is not only used in products or objects but also in foods. According to the *Islamic* law, *najis* is defined as something dirty and disgusting (Al-Qaradawi, 2001; SM, 2009). If a Muslim is in contact with *najis*, the cleansing process needs to be done before proceeding to religious duties such as prayer (Al-Qaradawi, 2001). Categories of *najis* and the cleansing methods are shown in Table 1. The foods or products are considered *najis* if they are contaminated or come in direct or indirect contact with extreme *najis* (SM, 2009). Ordinarily, cleaning with detergent and water do not constitute fulfilling the requirement of *Islamic* law in the cleansing of extreme *najis*. In order to comply with the requirements of *halal*, *Islam* requires proper clay water cleansing through 7 steps of washing and one of which shall be water mixed with soil/clay (SM, 2009; Ab-Rahman & Masran, 2008). The way to cleansing this extreme *najis* is called *samak or dibagh* in Arabic, *sertu* in Malay and is also known as *Islamic* cleansing.

Table 1. Categories of *najis* and its cleansing method

Classification	Example of *najis*	Cleansing method
Light	Urine of boys aged less than 2 years old and fully breastfed.	Remove *najis* and sprinkle water over the contaminated area.
Medium	Apart from the heavy and light *najis* vomit, blood, urine, and so forth.	Remove *najis* and wash with free flow clean water until achieve absence of appearance/colour, odour and feel.
Extreme/Severe	Dogs and pigs (khinzir) that also include any liquid and object discharged from their orifices, descendants and derivatives.	Remove *najis* and seven times of rinsing with clean water; - one of which is water that is mixed with the soil/clay. This cleansing method is called *samak*.

As in the traditional practice of *samak*, clay or soil can be used to cleanse extreme *najis* without any restriction on the concentration of clay used. However, for industrial application, it requires some modifications of this traditional practice. This is to ensure that it will not cause any damage and scratch on the specific accessories of the equipment which is very delicate and expensive. The clay particle size distribution (PSD) should be studied in order to preserve the safety of machines, equipment and users. The particle size of clay must be fine and contain no other particles that can cause blockages or scratches to the equipment. Most importantly, it must comply with safety and quality of the products manufactured as well as the regulation and guidelines practiced. Therefore, a specific *samak* clay standard for industrial application is needed to meet the *halal* requirement as well as meeting the specifications of the equipment or machines. To date, there is no research on *samak* clay for *Islamic* cleansing being carried out for

industrial application. Therefore, this study was conducted to develop the guidelines of clay usage for the purpose of *samak* as the potential cleansing agent in the *halal* industry application for foods, cosmetics, pharmaceutical and logistic. In addition, the physico-chemical characterizations of clays, safety and toxic metals content were determined.

2. Experimental procedures

Three clay samples from different locations in Perak, Malaysia and commercial samak clay as standard were selected in this study (Table 2). The clay pH was determined in deionised water using 1:2.5 ratio (clay: water) and stirred vigorously for 2 min (Rayment & Higginson, 1992). All pH readings were recorded using a pH meter. The PSD and texture analysis were measured using a successive sedimentation pipette method (Gee & Bauder, 1986; Day, 1965). The moisture content of clay samples was identified using gravimetric method (Walter, 1986) and heavy metal content was detected by inductively couple plasma-mass spectrophotometer (ICP-MS) (Falciani *et al*., 2000).

Table 2. The source of clay samples

Clay Samples	Source	Code of Sample
Standard	Negeri Sembilan	A
Bercham	Perak	B
Tapah	Perak	C
Sayong	Perak	D

3. Results

3.1 Physico-chemical Properties

The pH values of all clay samples were in the range of 4.85-6.71 (Table 3). Clay A (standard) exhibited the neutral condition (pH 6.71), whereas, clay B, C and D were in the acidic group. From the PSD study, clay D possessed the highest clay content (53.95%) as compared to clay A (35.99), B (42.31%) and C (23.66%). The particle size of clay is < 2 μm, while silt and sand are 2-20 μm and >20 μm, respectively. The texture class of clays was identified according to USDA textural triangle as illustrated in Figure 1. The moisture contents of all clays suggest that they were in rather dried condition (1.55-3.51%), whereby, clay C gave the lowest water content (1.55%). For the safety assessment, toxic metals such as arsenic (As), antimony (Sb), cadmium (Cd) and lead (Pb) were determined on the clay samples. Table 4 showed the clays results as compared with the Malaysian Food Regulation 1985 which stated the maximum permitted level of metal contaminants for As (0.7 ppm), Sb (0.7 ppm), Cd (0.7 ppm) and Pb (7 ppm). All the clay samples did not exceed the levels specified in the Regulation and as such they are safe to use.

Table 3. Physico-chemical properties of clays

Clay Sample	PSD*			Soil Texture Class (USDA)	Moisture content (% w/v)	pH
	Clay (<2 μm)	Silt (2-20μm)	Sand (>20μm)			
A	35.99	59.65	4.21	Silty clay loam	1.79	6.71
B	42.31	29.08	28.40	Clay	3.45	5.28
C	23.66	76.33	0.01	Silt loam	1.55	4.85
D	53.95	45.27	0.76	Silty clay	3.51	5.02

*PSD=Particle size distribution

Fig. 1. USDA textural triangle (Image source: www.soilsensor.com)

Table 4. Heavy metal content in clay samples and limit permitted by Malaysian Food Regulation (1985)

	Heavy metal (ppm)			
	As*	**Sb***	**Cd***	**Pb***
Malaysian Food Regulation (1985)	0.7	0.7	0.7	7.0
Clay Sample				
A	0.02	0.01	0.02	0.31
B	0.02	0.01	0.02	0.11
C	0.01	0.01	0.01	0.22
D	0.05	0.01	0.02	0.34

*As=Arsenic, *Sb=Antimony, *Cd=Cadmium, Pb=Lead

4. Discussion

All of the clay samples were in a slightly acidic to neutral range (pH 4.85–6.71) compared to many commercial detergent products with their pH values above 8.5, which is in the alkaline range (Friedman & Wolf, 1996; Patterson, 2009). The pH value is a very important criterion because the high alkaline pH water may affect the environment and natural surface when it is being discharged (Patterson, 2009). In addition, pH plays a part in overcoming the problem of rust in the machinery or equipment. Corrosion can occur at the minimum level in the pH range of 6-12, while rust can rapidly occur outside this range (Llewellyn & Hudd, 1998). Under very acidic or alkaline conditions rust would quickly occur because of the reduction of hydrogen ions. Meanwhile, not all metals have the same level of corrosion resistance as it depends on the type of metal (David, 2005). Thus, the pH values of clay samples obtained in this study are seen to help in conserving the natural environmental aspect when they are used clay as a cleansing material for *halal* compliance in the industries. Furthermore, it is better than compared regular detergents as a safe pH range.

Most of the clays have fine particle sizes as shown from the PSD results (Table 3). The textures of the clays are mostly silt clay. The best clay in this study is sample D, which contained 53.95% clay and 0.76% sand. The smaller particle size of clay contributes to the large surface area or volume of the clay (Dastjerdi & Montazer, 2010; Parolo *et al*., 2010). Therefore, the ability of clay to absorb and to carry impurities would increase. Similarly, clay has the appropriate criteria as an ingredient in developing products used for cleaning. Clay has been used as an additive in cleaning products as it impacts on the viscosity. Viscosity is important in controlling the flow of a product on the target surface. Additionally clay also can help in improving the texture of the product such as adding shine on their products (Anonymous, 2007). In addition, small particle size facilitates the sample to pass through the manufacturing equipment and processing lines, thus reduce the possibility of the surfaces of the

equipment from being damaged, scratched, and clogged. Therefore, all the clay samples in this study are acceptable to use in *samak* cleansing products.

The standard moisture content of products such as powder detergent is 1.4-28.7% (Patterson, 2009). Since there is no standard or guideline for the *samak* clay powder, the standard moisture content of powder detergent is used in the development of *samak* clay requirements. The present study indicated that all the clays are in dried and stable condition for longer storage based on standard state above. This is because both the material is in powder form and the purposes of application are same.

Heavy metal content in the clay samples met the specification in Malaysian Food Regulation 1985 and did not exceed the allowable limit. This Regulation ensures safe products from manufacturers to consumers. Heavy metals are dangerous because they form bioaccumulation in the body (Collins & Stotzky, 1991). These compounds are accumulated in living things when they are taken up and are stored faster than they are metabolized or excreted. Heavy metals cannot be degraded or destroyed. Therefore the heavy metal contaminants in the *samak* clay samples should be determined to ensure that is safe for use.

5. Conclusions

All clay samples met the required criteria. Hence, they can be used as a *samak* cleansing agent that is applicable to the halal industries such as in foods, pharmaceutical, cosmetics and logistics. The development of *samak* clay specifications and standards for *Islamic* cleansing application can significantly contribute to the overall growth of the *halal* industry and enhance the level of confidence of the consumers in *halal* products. With the specifications that meet the *halal* and industrial requirements, the *samak* clay will facilitate the cleansing of extreme *najis* throughout the supply chain system of the *halal* industries. In addition, this product can be conveniently and economically produced.

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