

1 INTRODUCTION

1.1 Research Background

Water is made out of two hydrogen and one oxygen, it is one of the most essential elements to health and is so important that your body actually has a specific drought management system in place to prevent dehydration and ensure your survival. Water makes up more than two thirds of human body weight, and without water, we would die in a few days. The human brain is made up of 95 % water, blood is 82 % and lungs 90 %. A mere 2 % drop in our body's water supply can trigger signs of dehydration: fuzzy short-term memory, trouble with basic math, and difficulty focusing on smaller print, such as a computer screen. Therefore water is essential to sustain the human life and good clean water accessibility is very importance. These is because good access to clean water will benefit us with good health and prevent hydration of the body. The problem faced nowadays is the water shortag (Shakhashiri, 2011)e problem due to the expanding of world population and the current water source is fresh water where it only covered 1.7 % of the world water. Therefore seawater which cover 96 % of the world water has to use (Wolf, 1999). The country that has started to u (Esplugas, et al., 2002) (Pera-Titus, et al., 2004)se seawater as their main source of water are the Middle East country and Africa. Both country depend on the desalinate seawater to overcome their water shortage problem (Ghaffour, et al., 2011).

The seawater can be desalinate to clean water using several method like distillation (Ghaffour, et al., 2011)where the water is heated at high temperature so that the water evaporates and separated from the salt, electrodialysis where the salt ion is transport from one solution through ion-exchange membranes to another solution under the influence of an applied electric potential difference, and the reverse osmosis (Akili, et al., 2008) (Francois, et al., 2008) method where membrane is used. The method used for desalination of seawater mostly require high energy which will lead to high cost (Shakhashiri, 2011). That is why there still many country that have not use seawater as their main source of water supplies even though seawater cover 96 % of the world water.

The researcher nowadays also, are trying to develop or modified the current technologies for seawater desalination so that the energy and cost consumption can be reduced.

These have led to the study in the field of advanced oxidation process (AOP) as the alternative to the desalination technologies. The rationales of these AOPs are based on the in-situ generation of highly reactive transitory species for mineralization of refractory organic compounds, water pathogens and disinfection by-products (Esplugas, et al., 2002) (Pera-Titus, et al., 2004). Among these AOPs, heterogeneous photocatalysis employing semiconductor catalysts (TiO_2 , ZnO , Fe_2O_3 , CdS , GaP and ZnS) has demonstrated its efficiency in degrading a wide range of ambiguous refractory organics into readily biodegradable compounds, and eventually mineralized them to innocuous carbon dioxide and water. Among the semiconductor catalysts, titanium dioxide (TiO_2) has received the greatest interest. The TiO_2 is the most active photocatalyst under the photon energy of $300 \text{ nm} < \lambda < 390 \text{ nm}$ and remains stable after the repeated catalytic cycles, whereas CdS or GaP are degraded along to produce toxic products (Malato, et al., 2009). Other than these, the multi-faceted functional properties of TiO_2 catalyst, such as their chemical and thermal stability or resistance to chemical breakdown and their strong mechanical properties have promoted its wide application in photocatalytic water treatment (Chong, 2010).

For these study, the photocatalytic reaction of the Titanium Dioxide was tested on the seawater in order to see the effectiveness of the reaction to absorb the salt content of the seawater and purification of the seawater. In these study also the Titanium Dioxide was mixed with biomass ash and metal as supported catalyst in order to improve the efficiency and the performance of the catalyst. The catalyst also was tested with different wavelength to see whether the performance of the catalyst increase or decrease due to the different wavelength light.

1.2 Motivation and statement of problem

Water is known as a colourless, transparent, odourless, liquid which forms the seas, lakes, rivers and rain and is the basis fluid of the living organism (Anon., 2014). All form of life need water and human consume drinking water which has qualities with the human body. Ordinary rain water in many countries has been polluted and therefore it is not safe to

drink directly. This natural resource has become scarce with the growing world population, and its availability is a major social and economic concern (Anon., 2004).

Based on the U.S Geological Survey, it is found that 96.5% Earth's water is located in seas and ocean and 1.7% of Earth's water is located in the ice caps. Approximately 0.8% is considered to be fresh water. The remaining is made up of brackish water, slightly salty water found as surface water in estuaries and as ground water in salty aquifers(Gleick 1998). Water shortages have plagued many people and human have long searched for a solution to Earth's lack of fresh water supplies.

Today, the world is concern on the problem related to the production of potable water. This is because the project population growth and demand exceed conventional available water resources. According to Service (2006), over one billion people are living without clean drinking water and approximately 2.3 billion people which is 41% of the world population live in region with water shortages. Besides that, most of the solutions that present nowadays are not sufficient to cope with the increasing demand and decreasing supply. Furthermore, most of the traditional source like the river, lake and ground water is misused and causing them to diminish through time (Greenlee et al. 2009). Therefore, as a solution, human being has to find another alternative to overcome this problem. The solution is the seawater because it is abundant and underutilised.

Israel for instance, when their water balance shows an increasing deficit throughout the years and the other regional demands for their water, their authorities has launched the desalination master plan, compromising a large scale seawater desalination of seawater in order to overcome the problem (Lokiec & Kronenberg 2003). While in China, they have been developing seawater technologies for the past six decades to overcome their water shortage problem especially at their coastal areas (Zheng et al. 2014). Thus, desalination is the best solution for the world water shortage problem but it is estimated that some 30% of the world's areas suffer from salinity problem and the remediation is seen very costly (Anon., 2014). Therefore, another method of purifying the seawater need to be developed.