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REMOVAL OF DYES BY USING PUMPKIN SEEDS AS ADSORBENT

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ABSTRACT

Adsorption method was commonly applied in wastewater treatment to remove dyes due to its simplicity of design and ease of operation. However, the cost of conventional adsorbent such as activated carbon is too high and required additives to improve it efficiency. Because of that, many agriculture waste had been studied as potential adsorbent to replace the current conventional adsorbent. Thus the aimed of this research is to prepared eight types of adsorbent from pumpkin seeds, and used it in adsorption process to determine the effectiveness of the adsorbents to remove basic dye methylene blue (MB) and acidic dye methyl orange (MO) from simulated wastewater. The pumpkin seeds were subjected into two type of treatments which are physical and chemical treatments. After the adsorbent preparation was completed, Fourier transform infrared spectroscopy (FTIR) was used to determine the number and positions of the functional groups available on adsorbent surface. In this research, the effect of adsorbent dosage, contact time and initial dyes concentration were studied toward percentage removal of dyes. The results showed that, as the adsorbents dosage, contact time and dyes initial concentration were increased, the percentage removal of dyes also increased. This research can be further used to design adsorption columns for dyes removal.

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INTRODUCTION

1.1 Research Background

The application and release of synthetic dyes from textile, food, printing and ink, paper and plastics enterprises is a natural wellbeing concern particularly to developing countries (Feng et al. 2011). The textile industry alone expends an abundance of 1.0 x $\mathbf{10^7}$ kilograms of dyes for every year around the world (R. Ahmad and Kumar 2010) with just about 1 million kilograms of dyes for every year being released into the aqueous environments (Cestari et al. 2007). Usually in nature, the synthetic dyes are stable, due to it aromatic structure and this aromatic structure also can cause this dyes and their break down products poisonous, cancer-causing and can alter the DNA structure of the existing organism (Carmen and Daniela 2010).

The dyes are divided into two part which is anionic dye and cationic dye. Methylene blue (MB) is a common cationic dye while methyl orange (MO) is a common anionic dye. In aqueous solution, cationic dyes dissociated into positively charged ions because of the existence of the protonated amine or sulphur containing group, while anionic dyes dissociated into negatively charged ions because of the existence of the sulphonate ($\boldsymbol{SO_3^-}$) groups.

Dyes loaded wastewaters effect marine biological systems, diminishing light presence for photosynthesis, and gas disintegration in lakes, streams and other water bodies (Saratale et al. 2011). Furthermore, the huge majority of these dyes have been revealed to cause sensitivity, dermatitis, skin disturbance and intestinal disease to people (Golka, Kopps, and Myslak 2004; da Silva et al. 2011). Hence lacking a proper treatment, the remaining of these dyes will be discharged into the ecosystems and thus create a dangerous risk to survival of both earthbound and oceanic biological ecosystems (Carneiro et al. 2010). Numerous treatment techniques have been created to treat the dyes loaded wastewater. This treatment can be divided into three parts which are physical, chemical and biological treatment.