Watcharapong Wararam 2014: Treatment of Formaldehyde in Synthetic Wastewater by Adsorption on *Cyperus corymbosus* Rottb. Charcoal and *Typha angustifolia* Linn. Charcoal in Combination with Grass Filtration and Constructed Wetland System. Doctor of Philosophy (Environmental Science), Major Field: Environmental Science, Department of Environmental Science.
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The purpose of this research was to develop the grass filtration (GF) and constructed wetland (CW) system for enhancing the removal efficiency of formaldehyde (FM) in synthetic wastewater at concentration of 20 mg/L. The three biocharcoals from *Cyperus corymbosus* Rottb. charcoal (C-char), *Typha angustifolia* Linn. charcoal (T-char) and commercial coconut shell charcoal (Co-char) were conducted to FM adsorbents. The analysis results of physical characteristics when compare with Co-char were found that C-char and T-char had a lower surface area of 17 and 15 m^2/g respectively, a higher total pore volume of 2.41 and 2.16 cm^3/g respectively and a higher pore size of 56.34 and 55.70 A^o respectively. The procedure for FM analysis was the chromotropic acid spectrophotometric method. The experiments were divided into 3 steps. The first step was to investigate the suitable adsorption condition and the adsorption isotherm of these three biocharcoals by batch experiments. The results revealed that at the same condition (pH 5, agitation time and contact time of 30 min and agitation speed of 100 rpm with exception of T-char at 50 rpm) the FM removal achieved for C-char, T-char and Co-char were 1.35, 0.73 and 0.43 mg respectively. The adsorption mechanism of FM onto C-char and T-char were described by both the Langmuir and Freundlich isotherms while FM adsorption on Co-char satisfied only the Freundlich isotherm model. The second step, the continuous experiments were performed to find out the ratio by weight of each biochar to soil which effecting on efficiency of FM removal and breakthrough curves. The results showed that the ratio at 1:50 was the suitable condition for these three biochars which the maximum FM removal at 95.04, 93.31 and 94.17% respectively were achieved. From breakthrough curves at flow rate of 10 mL/min of each biochar the breakthrough points were 300, 200 and 100 mL respectively and the exhaustion points were 2,950, 1,200 and 1,100 mL respectively. Therefore, the C-char was the better FM adsorbent than the another two biochars. The final step, the filtrated lysimeter technique was employed by simulating the GF and CW system of LERD-project. The comparative experiment units were the type of treatment plants (*Cyperus corymbosus* Rottb. and *Typha angustifolia* Linn.) and growing materials (mixed C-char and soil and soil only). The results revealed that the experimental units of two systems which using mixed C-char and soil and growing *Cyperus* had the highest FM removal efficiency at 99.53% in the first week of GF and 95.06% of CW at flow rate of 100 mL/min. Furthermore, CW was found that breakthrough point was 20 L, also found a lot of *Pseudomonas* spp. in rhizosphere and no vaporization of FM. Therefore, the developed GF and CW system from this study could be considered as a potential FM treatment system for the treatment of industrial wastewater which contaminate with FM.

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