Adsorption of ammonia and total phosphorus in surface water using zeolite and activated carbon: case study of Chuat Man Canal, Samut Prakan / Anyarin Pithapakdeesatith, Natha Hungspreug, Bundit Anurugsa

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Abstrak

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Ammonia and phosphorus have been recognized as the cause of eutrophication in surface water. Chuat Man Canal is faced with water quality degradation problem due to the high concentrations of ammonia and total phosphorus in the water body that makes it unsuitable for fish ponds. Removal of ammonia and phosphorus by the adsorption process is simple and not requires chemical use. In addition, ammonia is well adsorbed by activated carbon and zeolite while phosphorus is adsorbed by zeolite. This research used zeolite and activated carbon for the adsorption of ammonia and total phosphorus. The results of laboratory experiments at 30 °C 200 rpm 60 minutes, revealed that adsorption of ammonia using zeolite correlated with Freundlich isotherm (R2 = 0.9031). For ammonia adsorption using activated carbon, it correlated with Langmuir (R2 = 0.9596) and Freundlich (R2 = 0.9113) isotherms, respectively. For field experiment, 9 zeolite and activated carbon adsorbent pads with ratio of 1.6:1 by weight were placed across the canal sections. Each pad had 2 openings and each opening contained its adsorbent volume of 1.0 × 0.015 × 0.6 m3 (width × length × height). The front opening contained 5 kg of activated carbon while the back part contained 8 kg of zeolite. During the study, water flow velocity at surface of water was ranged from 0.022 - 0.027 m/s. Concentration of ammonia in influent and effluent was ranged from 1.755- 8.817 mg/L and 1.473-7.063 mg/L, respectively while that for total phosphorus was ranged from 0.045 - 0.095 mg/L and 0.042 - 0.089 mg/L, respectively. The maximum removal efficiency occurred 20 and 43 minutes after installation of the adsorption pads which were 6.73% for total phosphorus and 23.17% for ammonia, respectively.