Pengembangan Metode DGT Diffusive Gradient in Thin Film) dengan Binding Agent CaO/Biochar dari Cangkang Telur dan Jerami untuk Penyerapan Fosfat di Lingkungan = Development of the Diffusive Gradient in Thin Film (DGT) Method with Binding Agent CaO/Biochar from Eggshells and Rice Straw for Phosphate Absorption in the Environment.

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Abstrak

Fosfor atau yang sering ditemukan dalam bentuk fosfat di lingkungan terutama lingkungan perairan diidentifikasi sebagai kontaminan utama yang menyebabkan ledakan alga dan eutrofikasi. Penyerapan fosfat di lingkungan perairan dilakukan dengan membandingkan kemampuan adsorpsi material cangkang telur (CaO), Biochar (BC), dan CaO/Biochar pada variasi massa 1:1, 1:2 dan 2:1 dari pemanfaatan limbah cangkang telur dan jerami. Masing-masing material disintesis dengan mentode ball milling dan pirolisis. Kapasitas adsorpsi diuji dalam variasi material, variasi waktu kontak, variasi konsentrasi larutan serta variasi pH larutan. Isotherm dan kinetika adsorpsi material sesuai dengan isotherm adsorpsi langmuir dan merupakan kinetika adsorpsi pseudo second order (PSO). Material CaO/Biochar 1:2 menunjukkan kapasitas adsorpsi fosfat tertinggi pada pH 12 dikonsentrasi 15 ppm dengan waktu kontak 24 jam. CaO/Biochar 1:2 diaplikasikan dalam proses penyerapan fosfat menggunakan metode Diffusive Gradient in Thin Film sebagai gel pengikat (binding gel) yang bertindak sebagai adsorben. Teknik DGT merupakan teknik preparasi sampel secara in situ dalam mengidentifikasi keberadaan fosfat yang merupakan spesi labil. Material binding agent, dikarakterisasi menggunakan instrument FTIR, XRD dan BJH-BET. Keberhasilan sintesis binding gel CaO/Biochar 1:2 dan Ferryhydrite ditunjukan dengan munculnya serapan yang sama dengan diffusive gel menggunakan FTIR. Waktu optimal DGT CaO/Biochar dan DGT Ferryhydrite t adalah 24 jam, pada konsentrasi larutan fosfat 10 mg/L untuk DGT CaO/Biochar dan DGT Ferryhydrite dengan nilai pH optimum masing-masing untuk DGT CaO/Biochar adalah 5 dan DGT Ferryhydrite adalah 3. Analisis sampel perairan menggunakan teknik DGT dengan binding gel DGT CaO/Biochar dan DGT Ferryhydrite menunjukan bahwa binding gel DGT CaO/Biochar lebih baik dalam mengadsorpsi fosfat di air danau.

.....Phosphorus or which is often found in the form of phosphate in the environment, especially aquatic environments, has been identified as the main contaminant that causes algae blooms and eutrophication. Phosphate absorption in the aquatic environment was carried out by comparing the adsorption capabilities of eggshell (CaO), Biochar (BC) and CaO/Biochar materials at mass variations of 1:1, 1:2 and 2:1 from the use of eggshell and straw waste. Each material was synthesized using ball milling and pyrolysis methods. Adsorption capacity was tested in material variations, contact time variations, solution concentration variations and solution pH variations. The adsorption isotherm and kinetics of the material are in accordance with the Langmuir adsorption isotherm and are pseudo second order (PSO) adsorption kinetics. The CaO/Biochar 1:2 material shows the highest phosphate adsorption capacity at pH 12 at a concentration of 15 ppm with a contact time of 24 hours. CaO/Biochar 1:2 was applied in the phosphate adsorption process using the Diffusive Gradient in Thin Film method as a binding agent which acts as an adsorbent. The DGT

technique is an in situ sample preparation technique for identifying the presence of phosphate, which is a labile species. The binding agent material was characterized using FTIR, XRD and BJH-BET instruments. The success of the synthesis of CaO/Biochar 1:2 binding gel and ferrihydrite was demonstrated by the appearance of the same absorption as the diffusive gel using FTIR. The optimal time for DGT CaO/Biochar and DGT Ferrihydrite is 24 hours, at a phosphate solution concentration of 10 mg/L for DGT CaO/Biochar and DGT Ferrihydrite with the respective optimum pH values for DGT CaO/Biochar being 5 and DGT Ferrihydrite being 3. Analysis Water samples using the DGT technique with DGT CaO/Biochar and DGT Ferrihydrite binding gels showed that the DGT CaO/Biochar binding gel was better at adsorbing phosphate in lake water.