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ของถ่านกัมมันต์จากผงถ่านหินแอนท์ไซด์

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HYDROTHERMAL PREPARATION AND CHARACTERIZATION
OF ACTIVATED CARBON FROM ANTHRACITE POWDER

Mr. Sittidej Sittipraneed

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย
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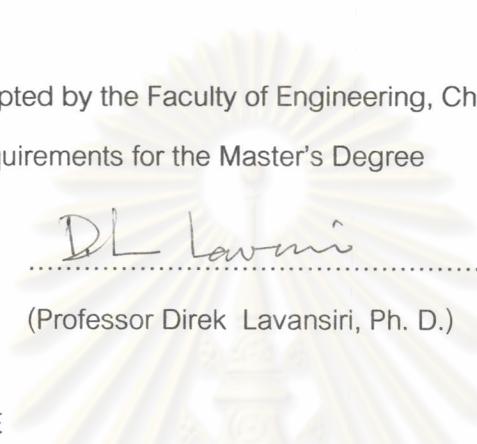
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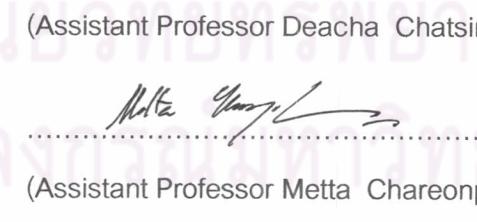
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งานวิจัยนี้ได้นำมาที่สภาระเห็นอภิการตามใช้เพิ่มรูปนูนของถ่านหินแอนทราไซต์ และถ่านกัมมันต์ 3 ประเภท คือถ่านกัมมันต์ทางการค้า ถ่านกัมมันต์จากยางรถยนต์ใช้แล้ว และถ่านกัมมันต์จากแอนทราไซต์ นำกลับและสารละลายไฮโดรเจนเปออกอิชีดได้ถูกใช้เป็นของเหลวที่ก่อให้เกิดสภาวะเห็นอภิการในระบบ ตัวแปรที่ทำการศึกษาคือ เเวลาที่ใช้ในการทำปฏิกิริยา การเตรียมถ่านแอนทราไซต์ด้วยสารละลายโซเดียมไฮดรอกไซด์หรือโพแทสเซียมไฮดรอกไซด์ก่อนทำปฏิกิริยา และความเข้มข้นของสารละลายไฮโดรเจนเปออกอิชีด จากผลการทดลองพบว่า เวลาที่ใช้ และ การเตรียมถ่านแอนทราไซต์ก่อนทำปฏิกิริยาไม่ส่งผลกระทบต่อรูปนูนของสัดくだครับอน ในการนี้ใช้น้ำกลั่นน้ำ ฟืนที่ผ้า และปริมาตรของเมโซพอร์ของถ่านกัมมันต์เพิ่มขึ้นเล็กน้อย ในขณะที่ปริมาตรไม่crowdลดลง นอกจากนี้รูปนูนของถ่านกัมมันต์ลดลงเมื่อความเข้มข้นของไฮโดรเจนเปออกอิชีดสูงขึ้น อย่างไร้ตามจากการทดลองสรุปได้ว่าวิธีนี้ไม่สามารถนำมาใช้เพื่อเพิ่มรูปนูนให้กับถ่านกัมมันต์ได้

ในการศึกษาคุณสมบัติการดูดซับในไฟล์ของเหลวและการนำกลับมาใช้ใหม่ด้วยน้ำที่สภาระเห็นอภิการนั้น พื้นอโลและลีบ้มอินทรีย์ เร็ด 31 ได้ถูกเลือกเป็นสารดูดซับตัวอย่าง ถ่านกัมมันต์ที่เตรียมจากผงแอนทราไซต์ที่กรองตื้นด้วยโคน้ำโดยตรง ถูกทดสอบเบรียบเทียบกับถ่านกัมมันต์ทางการค้า ผลการทดลองการดูดซับในไฟล์ของเหลวถูกระบุว่า ถ่านกัมมันต์ที่เตรียมได้นั้นมีความสามารถในการดูดซับพื้นอโลเบรียบได้กับถ่านกัมมันต์ทางการค้า แต่มีความสามารถในการดูดซับลีบ้มอินทรีย์ต่ำกว่าย่างซัดเจน นอกจากนี้ประสิทธิภาพในการนำกลับมาใช้ใหม่ด้วยน้ำที่สภาระเห็นอภิการนั้นสูง โดยการประสิทธิภาพในการนำกลับมาใช้ใหม่ครั้งที่ 1/ 2 ของถ่านกัมมันต์ที่เตรียมได้ และถ่านกัมมันต์ทางการค้าที่อิมด้วยไฟล์อโลคือ 55/98 และ 65/99% ส่วนในการนี้ที่อิมตัวด้วยลีบ้มอินทรีย์ เร็ด 31 คือ 78/100 และ 338/93% ตามลำดับ โดยสูญเสียเนื้อถ่านน้อยกว่า 4% ในกรณีนำกลับมาใช้ใหม่แต่ละครั้ง เนื่องด้วยการสูญเสียเนื้อถ่านที่ต่ำ และประสิทธิภาพในการนำกลับมาใช้ใหม่ที่สูง การนำกลับมาใช้ใหม่ด้วยน้ำที่สภาระเห็นอภิการลึงหมายรวมที่จะนำมาใช้บำบัดถ่านกัมมันต์ที่ใช้แล้ว

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ลายมือชื่อนิสิต..... สักกาต ลักษณะ.....
ลายมือชื่ออาจารย์ที่ปรึกษา.....

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KEY WORD: ACTIVATED CARBON / SUPERCRITICAL WATER / REGENERATION

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Supercritical water is used for enhancing porous properties of anthracite powder and three kinds of activated carbon: commercial activated carbon, activated carbon from waste tires and activated anthracite. Distilled water and hydrogen peroxide solution are used as a liquid medium in batch process supercritical water treatment. The experimental variables are treatment time, chemical (NaOH and KOH solution) pre-treatment and concentration of hydrogen peroxide solution. The results show that treatment time and chemical pre-treatment have little effect on the porous properties of the anthracite powder. In case of using distilled water as liquid medium, a slight increase in the surface area and mesopore volume is observed, while the micropore volume decreases. Moreover, the porous properties of activated carbon decrease while the concentration of hydrogen peroxide solution increases. However, it is clear that supercritical water treatment is not effective for improving porous properties of activated carbon.

In liquid-phase adsorption and supercritical water regeneration studies, phenol and organic dye Red 31, are selected as the representative adsorbates. The steam activated anthracite powder is compared with a commercial activated carbon. The results indicate that the obtained activated anthracite shows comparable phenol adsorption capacity but much lower dye adsorption capacity than the commercial one. However, supercritical water regeneration efficiency is remarkably high. The first/second regeneration efficiency of commercial activated carbon and activated anthracite exhausted with phenol are 55/98 and 65/99% and in case of RED 31 are 78/100 and 338/93% with losses of activated carbon less than 4% per regeneration. Because of little losses of activated carbon and successive regeneration, this regeneration method is suitable for regenerating exhausted activated carbon.

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NOMENCLATURES

Aa_bCc_d	Activated carbon prepared at $a^{\circ}\text{C}$ for b hr from char carbonized from anthracite powder at $c^{\circ}\text{C}$ for d hr
Aa_b	Activated anthracite prepared at $a^{\circ}\text{C}$ for b hr from anthracite powder without carbonization step
CAL	Commercial activated carbon (Calgon, U.S.A.)
AA	Activated anthracite prepared at 850°C for 2 and half hr from anthracite powder without carbonization step
WT	Activated carbon prepared at 850°C for 4 hr from char carbonized from waste tires at 500°C at the heating rate $5^{\circ}\text{C}/\text{min}$ for 1hr
Wa	a activated carbon treated with supercritical water treatment using distilled water as liquid medium
Ha	a activated carbon treated with supercritical water treatment using 15% by volume hydrgenperoxide solution as liquid medium
Ha($b:c$)	a activated carbon treated with supercritical water treatment using hydrgenperoxide solution with $b\text{H}_2\text{O}:c\text{H}_2\text{O}_2$ ratio as liquid medium

NOMENCLATURE (Continued)

P/P^o	Relative pressure [-]
q	The amount of N_2 adsorbed [cm^3 (STP)/g]
R_p	Pore radius [nm]
$dV_p/dlog(R_p)$	Pore size distribution [cm^3/g]
V_{meso}	Mesopore volume [cm^3/g]
V_{micro}	Micropore volume [cm^3/g]
S_{BET}	BET surface area [m^2/g]
Q	The amount of adsorbate adsorbed [g/g AC]
C_e	Equilibrium concentration [mg/l]



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