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INFLUENCE OF MIXING CONDITION ON
STYRENE-BUTADIENE DISSOLUTION RATE IN MINERAL OIL



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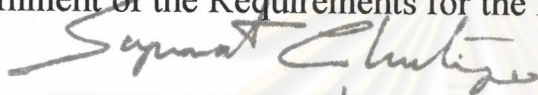
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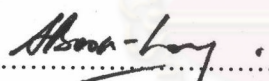


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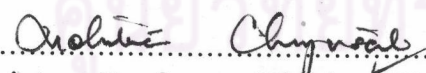
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ได้ทำการทดลองหาค่าสัมประสิทธิ์การละลายของสไตรีน-บิวตะไดอินในน้ำมันแร่ในถังกวนแบบ
 มาตรฐานที่อุณหภูมิระหว่าง 115°C ถึง 135°C และที่ความเร็วรอบระหว่าง 350 รอบต่อนาที ถึง 550 รอบ
 ต่อนาที โดยใช้ความเข้มข้นของของแข็งที่แขวนลอยในน้ำมันแร่ที่แตกต่างกัน ใบพัดที่ใช้มี 2 ชนิด ผลที่ได้
 นำมาเปรียบเทียบกับผลงานของผู้อื่นในถังกวนที่มีแผ่นกั้นและเสนอสมการในรูปของกลุ่มตัวเลขไร้มิติ คือ

$$Sh_T = r Re_a^p Sc^q$$

สำหรับค่าตัวเลขเรย์โนลด์อยู่ในช่วง 2.5685×10^3 ถึง 8.3864×10^3 และ ค่าตัวเลขชมิตที่อยู่ในช่วง
 1.0002×10^{10} ถึง 3.7200×10^{10} พบว่าค่าคงที่ r ขึ้นกับระบบที่ใช้ในการทดลอง จากผลการทดลองที่ความเข้ม
 ข้นค่าต่างๆ ได้ผลลัพธ์ดังต่อไปนี้

สำหรับใบพัดแบบมาตรฐาน 6 ใบ , $Sh_T = r Re_a^{1.35} Sc^{3.20}$

สำหรับใบพัดแบบใบพาย , $Sh_T = r Re_a^{0.57} Sc^{2.22}$

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ลายมือชื่ออาจารย์ที่ปรึกษา

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SAMARN POBOONCHUIN : INFLUENCE OF MIXING CONDITION ON STYRENE-BUTADIENE DISSOLUTION RATE IN MINERAL OIL. THESIS

ADVISOR : ASSISTANT PROFESSOR SASITHORN BOON-LONG, DR. 3' EME CYCLE, THESIS CO-ADVISOR : PRASERT KHUNTHONG, MR.

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Dissolution rate coefficient of suspended particles of styrene-butadiene in mineral oil were determined in baffled agitated vessel at temperatures between 115°C to 135°C and at rotational speed between 350 rpm to 550 rpm at different solid concentration in mineral oil. Two types of impellers were used. Results obtained were compared with previous works in baffled agitated vessel and correlated in terms of dimensionless number.

$$Sh_T = r Re_a^p Sc^q$$

for Reynolds number in the range of 2.5685×10^3 to 8.3864×10^3 and Schmidt number in the range of 1.0002×10^{10} to 3.7200×10^{10} .

It was found that the constant r depended on the system used in the experiment. In this work, the results obtained were as follows;

for standard six blade disc turbine: $Sh_T = r Re_a^{1.35} Sc^{3.20}$

for paddle: $Sh_T = r Re_a^{0.57} Sc^{2.22}$

ศูนย์วิทยทรัพยากร
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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

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NOMENCLATURE

Dimensions are given in terms of mass (M), length (L), time (t) and temperature (T)

A	=	Contact surface area of solid and liquid.....	(L^2)
c	=	Concentration.....	(ML^{-3})
dA	=	Exchange area.....	(L^2)
dm	=	Quantity of dissolved mass per unit time.....	(Mt^{-1})
d_p	=	Average particle diameter.....	(L)
d_p	=	Particle diameter.....	(L)
D_{AB}	=	Binary diffusivity for system A-B	(L^2t^{-1})
D_i	=	Impeller diameter.....	(L)
D_v	=	Average Diffusion coefficient	(L^2t^{-1})
D_v	=	Diffusion coefficient	(L^2t^{-1})
g	=	Gravitational acceleration	(Lt^{-2})
H_i	=	Impeller height from the tank bottom.....	(L)
H_l	=	Liquid height	(L)
k, K	=	Mass transfer coefficient ,Solid Dissolution Coefficient.....	(Lt^{-2})
L	=	Impeller blade length.....	(L)
m	=	Quantity of mass dissolved per unit time.....	(Mt^{-1})
N, n	=	Rotation speed.....	(t^{-1})
k_c	=	Average mass transfer coefficient.....	(Lt^{-1})
N	=	Mass flux across a phase boundary.....	$(L^{-2}t^{-1})$
N_A	=	Molar flux of species A.....	$(L^{-2}t^{-1})$
N_B	=	Molar flux of species B.....	$(L^{-2}t^{-1})$
p	=	Variable exponent	
q	=	Variable exponent	
r	=	Constant vary with impeller type and system geometry	
S	=	Fractional rate of surface renewal	(t^{-1})

t	=	Time.....	(t)
T, D	=	Tank diameter	(L)
V	=	Volume of liquid in the vessel	(L ³)
W	=	Mass of solid particles	(M)
W_o	=	Total mass charged	(M)
W_s	=	Mass needed to saturated the Liquid.....	(M)
W_i	=	Impeller blade width.....	(L)
W_b	=	Baffle width.....	(L)
x	=	Variable exponent	
X_A	=	Mole fraction of A.....	(dimensionless)
z	=	Thickness of the diffusion film	(L)
δ	=	Film thickness.....	(L)
μ	=	Liquid viscosity	(ML ⁻¹ t ⁻¹)
ρ_s	=	Solid density.....	(ML ⁻³)
ρ_l	=	Liquid density.....	(ML ⁻³)
w	=	Angular velocity	(t ⁻¹)
α_w	=	Shape factor of particle.....	(dimensionless)

Commonly used Dimensionless Groups

Re_a	=	Reynolds number referred to agitator ($D_i^2 N \rho_l / \mu$)
Re_p	=	Reynolds number referred to solid particle ($T d_p w \rho / \mu$)
Re_T	=	Reynolds number referred to tank ($T^2 N \rho / \mu$)
Sc	=	Schmidt number ($\rho_l D_v / \mu$)
Sh_p	=	Sherwood number referred to solid particle ($K d_p / D_v$)
Sh_T	=	Sherwood number referred to tank (KT / D_v)