

BELQCM

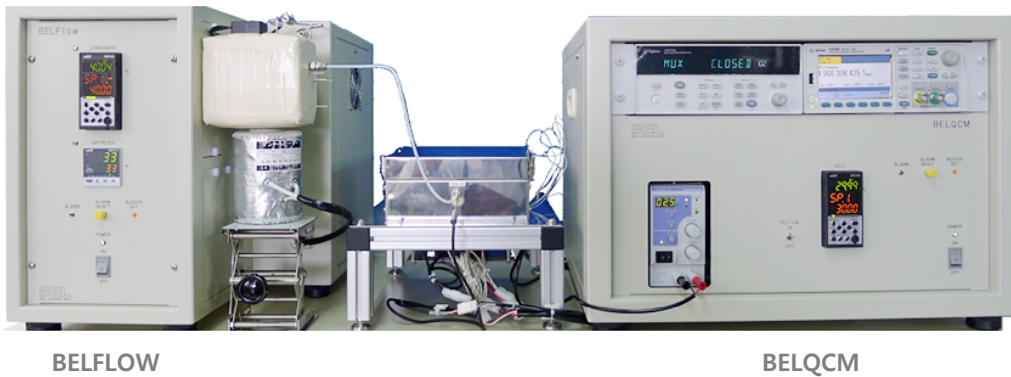
Nano-sensing adsorption process analysis
for Metal-Organic Framework (MOF)

Features

✓ Nanogram order measurement

✓ Real-time monitoring of the adsorption kinetics by frequency change

✓ Simultaneous 6 samples measurement

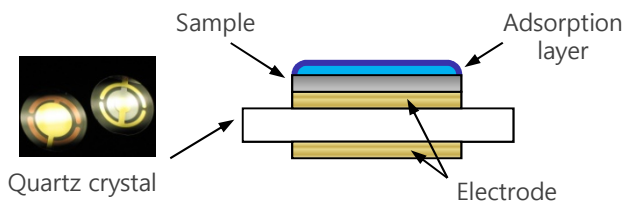


BELFLOW

BELQCM

Principal

Quartz Crystal Microbalance (QCM, 수정진동자 마이크로밸런스)는 두 물질의 상호결합 및 흡착 속도를 측정하거나 표면에 흡착된 물질들의 구조적 변화를 모니터링 하는데 이용되고 있습니다. 매우 얇은 quartz disc의 양면에 전극을 입혀 전압차를 발생시키면 수정의 역압 전현상(converse piezoelectric effects)에 의해 고유한 진동주파수로 진동하게 되는데, 이 진동주파수가 센서 표면에 특정 물질이 결합하게 되면 줄어들게 됩니다. 이와 같이 표면에 흡착되는 물질의 양을 진동주파수의 변화량을 이용하여 정교하게 측정할 수 있으며, 또한 표면의 특성에 따라 흡착되는 물질의 양이 달라지기 때문에 표면의 성질을 연구하는 데에도 사용될 수 있습니다.

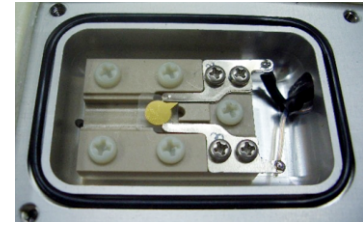
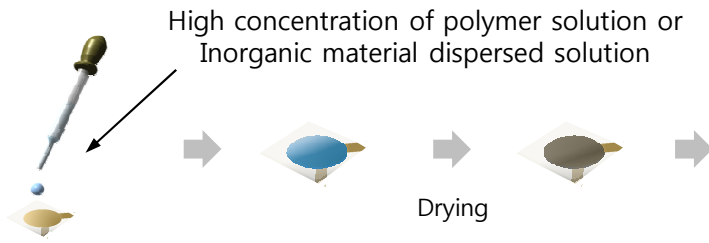


Adsorption/desorption

Frequency decrease/increase

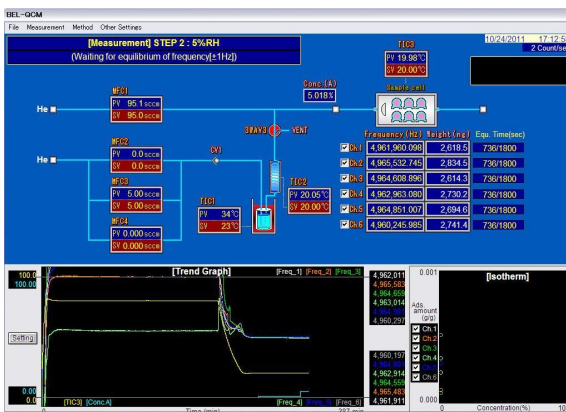
Theoretical resolution: $0.55 \text{ ng/cm}^2 = 0.1 \text{ Hz}$

Sampling

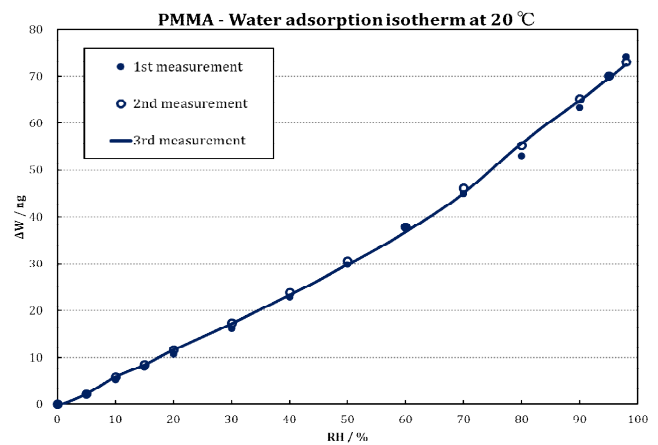


Electrode holder

Software



Result



Specifications

Model	Single sample (1 holder)	multi samples (6 holders)
Temp. range	10 to 80 °C	
Pretreatment	Max 80 °C	
Resolution	1.23 ng/cm ² = 0.1 Hz (6 MHz)	
Crystal oscillator	Material: Gold / Frequency resolution: 0.001 Hz / Electrode area: 19.6 mm (5 mmφ) Measurement weight: Max. 20 μg (sample + adsorption amount)	
Power	AC 100-120 V or 200-240 V	
Dimension	W320×D450×H320 (W200×D250×H195)	W550×D450×H380 (W340×D280×H220)

BELQCM

Model	BELFlow-1 (standard)	BELFlow-2 (Low conc.)	BELFlow-3 (mixing vapor)
Concentration (humidity) range	0, 2 - 95 vol% (%RH)	0, 0.02 - 95 vol% (%RH)	0, 0.02 - 95 vol% (%RH)
Condenser temp. range	10 to 80 °C		
Max. flow	100 sccm	100 sccm	200 sccm
Adsorbate	H ₂ O, Alcohol, Hexane, CO ₂ and etc.		
Computer	Windows series (256 MB main memory or more)		
Power	AC 100-120 V or 200-240 V		
Dimension	W320×D450×H400	W360×D530×H400	W570×D670×H1100

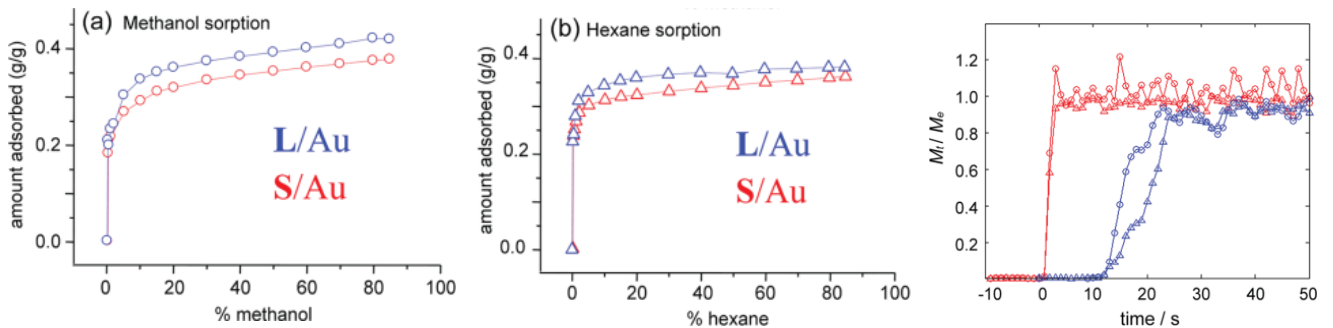
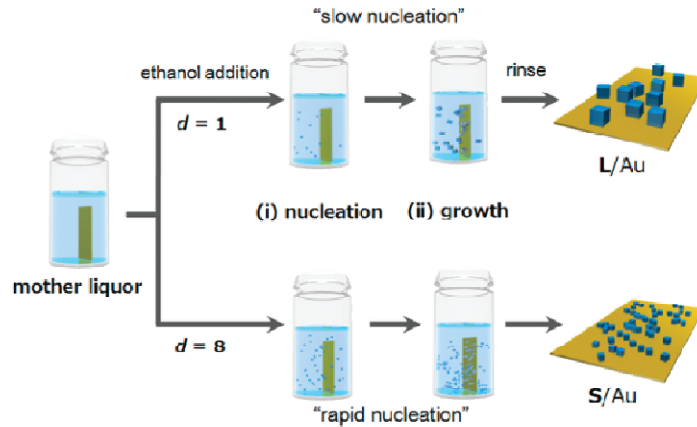
BELFlow

Adsorption gas, vapor controller

Applications

[1] S. Kitagawa, *J. Am. Chem. Soc.*, 2011, 133 (31), 11932 [2] K. Kaneko, *J. Am. Chem. Soc.*, 2011, 133 (38), 14880

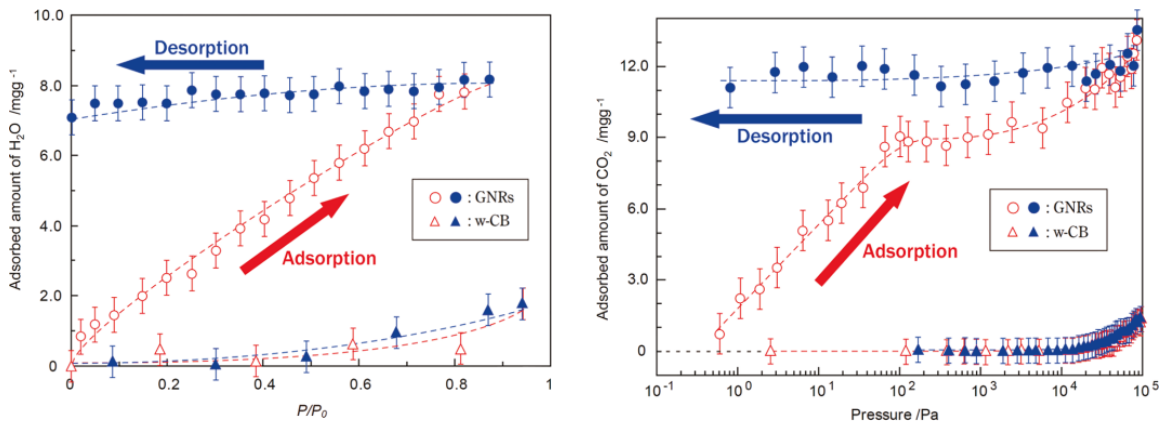
1 SUR-MOF



↑ Gold 코팅된 QCM substrate에 porous nanocrystal을 deposit 시킨 후 측정된 methanol, hexane의 흡탈착등온선 (298 K)

↑ Time-dependent mass uptake

2 Graphite Nanoribbon



↑ Graphite Nanoribbon과 well-crystalline CB의 H₂O (at 298 K), CO₂ (303 K) 흡탈착등온선