

## in situ XAFS for NbC catalyst

### NbC introduced into the mesoporous silica

TEOS, CTMABr, H<sub>2</sub>O, HCl    CTMABr: [CH<sub>3</sub>(CH<sub>2</sub>)<sub>15</sub>N(CH<sub>3</sub>)<sub>3</sub>]Br (C16)

stirring 24 h

filtrate

calcination 823 K

(air flow 5 h)

SBA-3

NbCl<sub>5</sub>/MeOH soln

impregnation (24 h)

calcination

carburization (20% CH<sub>4</sub>/H<sub>2</sub>)

1273 K, 0.5 h

imp Nb/SBA-3

imp NbC/SBA-3

### NbC incorporated into the mesoporous silica walls

stirring 24 h

filtrate

calcination 823 K

(air flow 5 h)

carburization (20% CH<sub>4</sub>/H<sub>2</sub>)

1273 K, 0.5 h

inc Nb-SBA-3

inc NbC-SBA-3

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### Nb K-edge in-situ XAFS measurement

#### Curve-fitting analysis

$k_3\chi(k)$  in  $k$ -space by REX2000 (Rigaku Co.)

#### in-situ condition

carburization

CH<sub>4</sub>: 30 cm<sup>3</sup>·min<sup>-1</sup>

H<sub>2</sub>: 120 cm<sup>3</sup>·min<sup>-1</sup>

TPR heating rate: 5 K·min<sup>-1</sup>

sampling rate: ~ 10 min/spectrum

SOR    2.5 GeV  
PF IMSS-KEK (Tsukuba)  
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