Design of Heterogeneous Catalysts Via Multiple Active Site Positioning in Organic-Inorganic Hybrid Materials

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$^1$H NMR (CD$_2$Cl$_2$): Hydrosilylation reaction of 5

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$^{13}$C CP-MAS NMR
Transformation of the sulfonate ester functionalized 4·SBA to the sulfonic acid functionalized 11·SBA

$^{29}$Si CP-MAS NMR
Transformation of the sulfonate ester functionalized 4·SBA to the sulfonic acid functionalized 11·SBA
$^{29}$Si CP-MAS NMR

Cleavage of the S-S linkage of the disulfide functionalized $2\cdot$SBA to the thiol functionalized $7\cdot$SBA

$^{29}$Si CP-MAS NMR

Cleavage of the S-S linkage of the disulfide functionalized $3\cdot$SBA to the thiol functionalized $8\cdot$SBA
Powder X-ray diffraction patterns

Transformation of ethyl sulfonate 4•SBA into sulfonic acid 11•SBA

Cleavage of the unsymmetrical disulfide bond in 2•SBA to produce surface thiol species 7•SBA

Cleavage of the symmetrical disulfide bond in 3•SBA to produce proximal surface thiol species 8•SBA
TGA measurement of 1•SBA

TGA measurement of 4•SBA
TGA measurement of 2\textcdot SBA

TGA measurement of 3\textcdot SBA