

1 Bimetallic Au–Ni/CSs catalysts for acetylene hydrochlorination

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9 **Supplementary Information**

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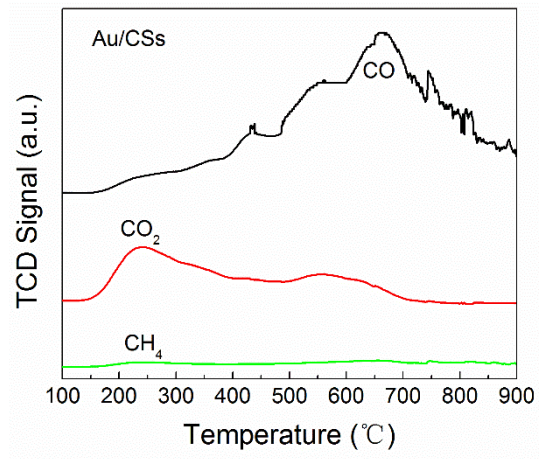
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22 **Fig. S1.** The mass spectrometry of the Au/CSs catalyst.

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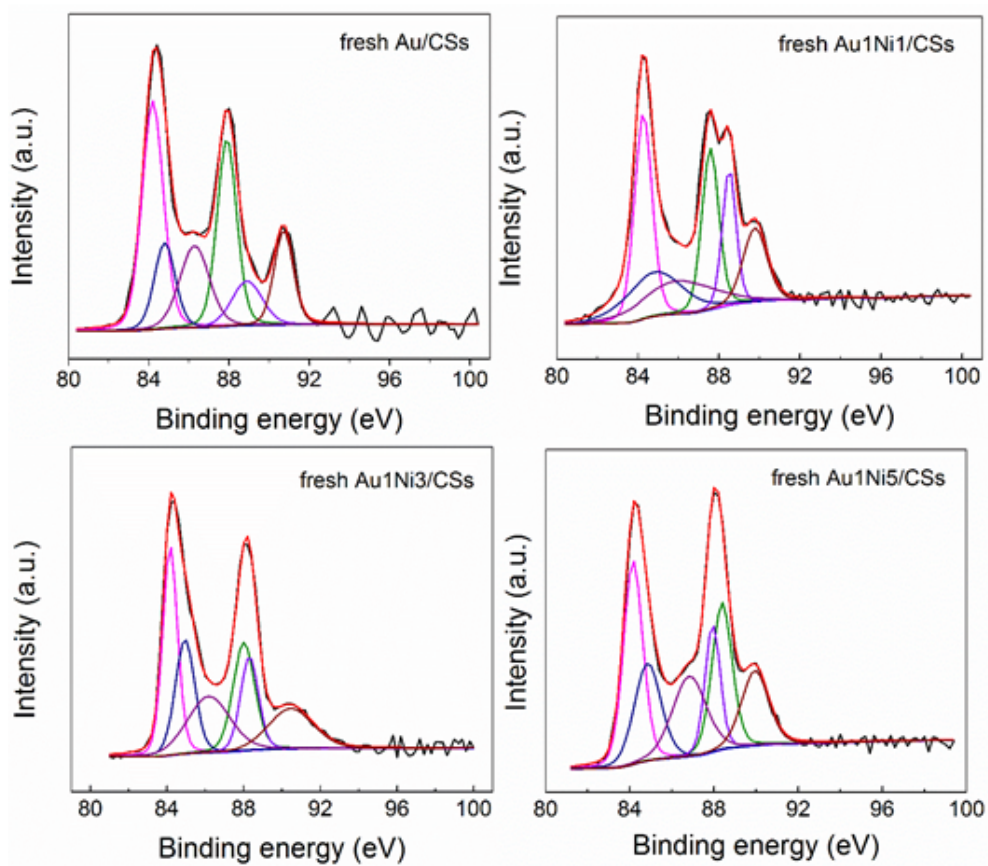
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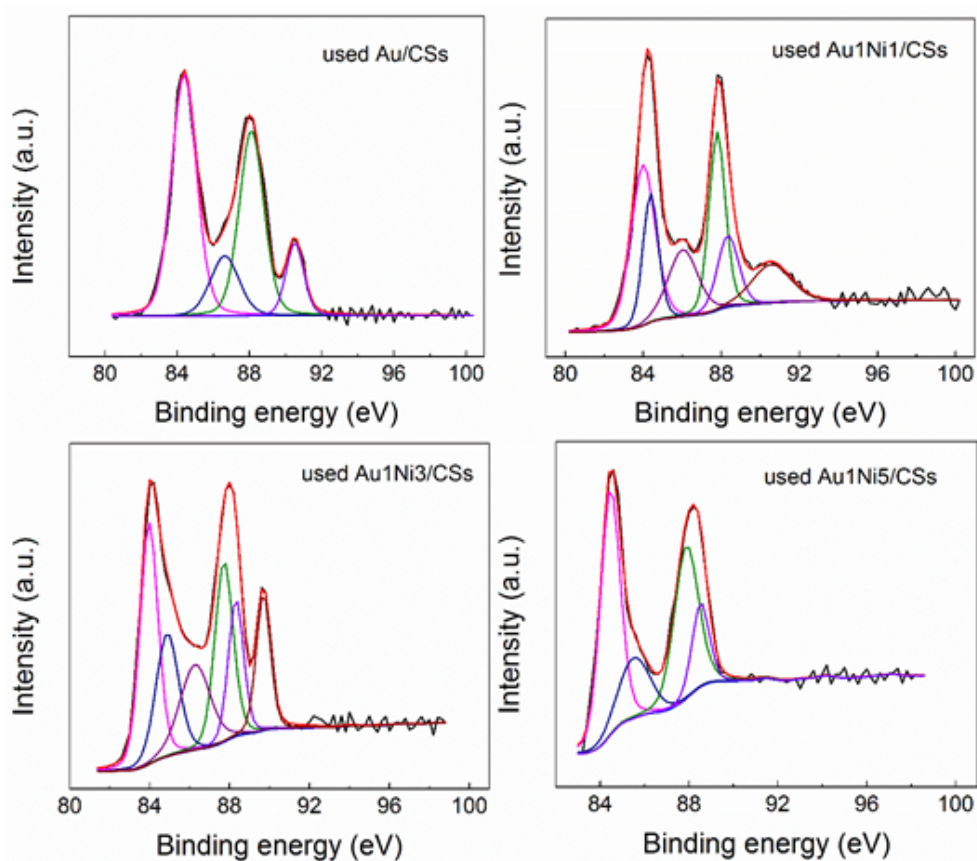
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 30 **Fig. S2.** Au4f XPS spectra of fresh catalysts.

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 37 **Fig. S3.** Au4f XPS spectra of used catalysts.

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62 **Table. S1.** The reduction temperature center of Au species.

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Catalysts	Reduction temperature center (°C)	
	Au <sup>3+</sup>	Au <sup>+</sup>
Fresh Au/CSs	310	/
Fresh Au1Ni1/CSs	318	346
Fresh Au1Ni3/CSs	333	377
Fresh Au1Ni5/CSs	315	386

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97 **Table. S2.** Size of Au particles in Au-based catalysts, determined by XRD<sup>a</sup>.

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Catalyst samples	Crystallite sizes of Au(111) (nm)	
	fresh	used
Au/CSs	<4 <sup>b</sup>	23±2
Au1Ni1/CSs	<4 <sup>b</sup>	12±2
Au1Ni3/CSs	<4 <sup>b</sup>	8±2
Au1Ni5/CSs	<4 <sup>b</sup>	21±2

<sup>a</sup> Error estimated from XRD peak broadening of 0.06° at the Au (111) reflection at 38.36° (2θ).

<sup>b</sup> It was not possible to assign any error band below 4 nm, as this size is below the XRD method

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118 **Table.S3.** The relative content and binding energy of Ni species in fresh catalysts.

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Sample	Ni%, Binding Energy (eV)				
	Ni <sup>0</sup> (%)	NiO (%)	sat NiO (%)	NiCl <sub>2</sub> (%)	Ni <sub>2</sub> O <sub>3</sub> (%)
FreshAu1Ni1/CSs	7.58 (853.0eV)	25.55 (854.6eV)	/	39.05 (856.0eV)	27.82 (857.1eV)
FreshAu1Ni3/CSs	20.92 (853.2eV)	29.04 (854.6eV)	31.98 (855.5eV)	18.06 (856.2eV)	/
FreshAu1Ni5/CSs	/	/		69.17 (856.1eV)	30.83 (857.1eV)

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