



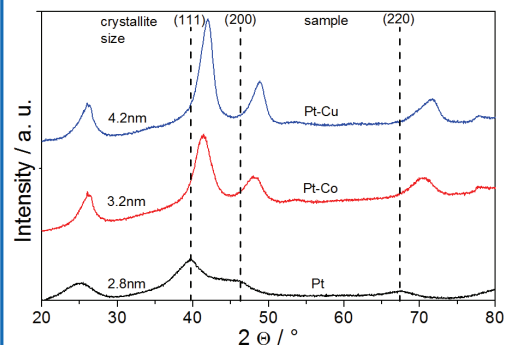
# Dealloyed Pt-Co and Pt-Cu Core-Shell Fuel Cell Catalyst

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Dealloyed carbon-supported “Pt-Co” and “Pt-Cu” core-shell PEM Fuel Cell electrocatalysts consist of bimetallic nanoparticles with a nm-thick pure Pt particle shell surrounding a PtCo and PtCu particle core. This unique compositional structure results in high electrochemical activity for the cathodic Oxygen Reduction Reaction (ORR) under fuel cell-relevant conditions.

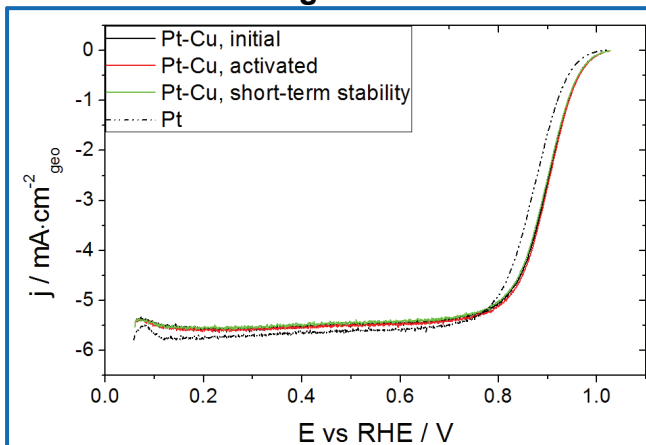
Catalyst	Pt:M (at%:at%)	Pt loading (Pt wt %)	M loading (M wt %)	Total (Pt+M wt %)
<b>Catalog # 78-1685</b>				
Pt -Co	2:1	21.5	3.1	24.6
<b>Catalog # 78-1688</b>				
Pt -Cu	1:1	21.1	6.3	27.4

## X-ray powder diffraction analysis

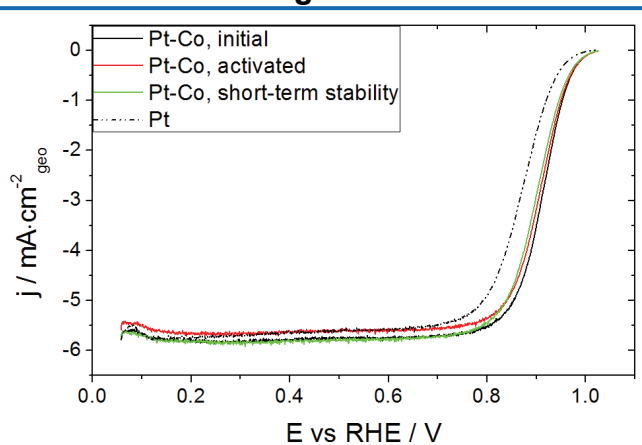


X-ray powder diffraction patterns of carbon-supported ORR electrocatalysts: commercial Pt (bottom), STREM “Pt-Co” (center), and STREM “Pt-Cu” (top); crystallite sizes are provided. vertical dashed black lines denote the reflections of pure Pt (# 04-0802).

### Catalog #78-1688



### Catalog # 78-1685



Linear sweep voltammetry (LSV) of Dealloyed STREM “Pt-Co” and STREM “Pt-Cu” after voltammetric cycling (initial, activated, after short-term stability), compared to a state-of-art 20 wt% Pt benchmark electrocatalysts; Tafel plots (insets) demonstrate a dramatic enhancement in catalytic activity for oxygen reduction for the dealloyed bimetallic nanoparticle catalysts.

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## Electrochemical ORR activity of dealloyed “Pt-Co“and „Pt-Cu“ catalysts

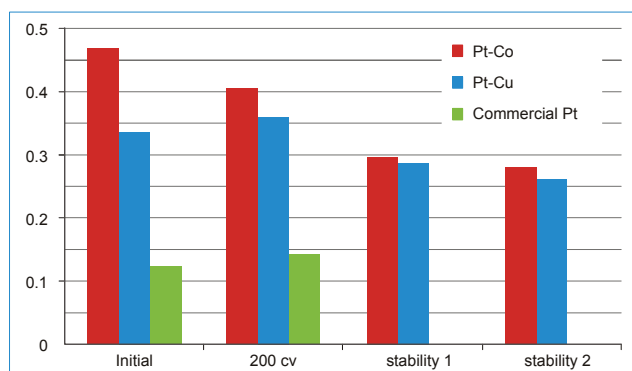
(Mass Activity  $j_m$  [A/mg<sub>Pt</sub>]; Specific Activity  $j_{spec}$  [ $\mu$ A/cm<sup>2</sup><sub>Pt</sub>]; Electrochemical Surface Area ECSA [m<sup>2</sup>/g<sub>Pt</sub>])

	state	$j_m$ [A/mg <sub>Pt</sub> ]		$j_{spec}$ [ $\mu$ A/cm <sup>2</sup> <sub>Pt</sub> ]		ECSA [m <sup>2</sup> /g <sub>Pt</sub> ]	
20 wt% Pt	activated	0.142	0.025	368.64	23.12	38.6	1.3
	initial	<b>0.468</b>	<b>0.061</b>	1288.47	17.75	36.3	4.7
Pt-Co	activated	<b>0.406</b>	<b>0.039</b>	1012.50	54.77	40.0	2.1
	stability 1*	0.297	0.029	932.36	100.80	39.2	6.6
	stability 2*	0.281	0.056	704.67	61.58	39.6	6.1
	initial	<b>0.336</b>	<b>0.057</b>	1151.26	105.63	28.9	2.6
Pt-Cu	activated	<b>0.366</b>	<b>0.054</b>	1132.16	87.96	32.1	2.7
	stability 1*	0.287	0.026	999.22	1.38	28.7	2.6
	stability 2*	0.262	0.036	850.40	59.64	30.6	5.2
	initial	<b>0.336</b>	<b>0.057</b>	1151.26	105.63	28.9	2.6

\* stability 1 and 2 represent activity after short-term and long-term testing, respectively

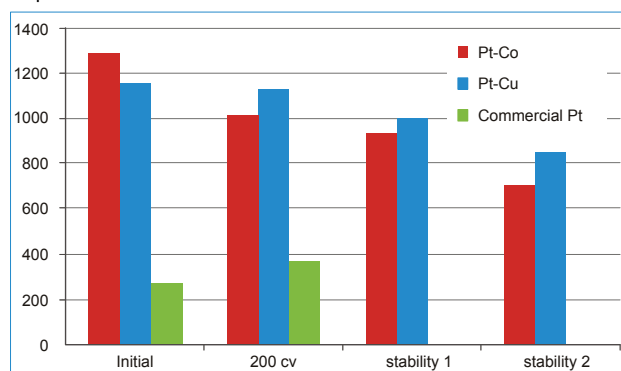
### Mass Activities of Pt-Co and Pt-Cu

$j_m$  [A/mg<sub>Pt</sub>];



### Specific Activities of Pt-Co and Pt-Cu

$j_{spec}$  [ $\mu$ A/cm<sup>2</sup><sub>Pt</sub>];



Pt mass-based and Pt surface area specific ORR activities for dealloyed STREM “Pt-Co” and “Pt-Cu” and state-of-the-art Pt catalyst after potential cycling treatments.

#### Reference:

„Activity of dealloyed PtCo<sub>3</sub> and PtCu<sub>3</sub> nanoparticle electrocatalyst for oxygen reduction reaction in polymer electrolyte membrane fuel cell“  
Oezaslan, Mehtap; Strasser, Peter; *Journal of Power Sources* 196 (2011) 5240–5249

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