Supporting information for publication

**Bimetallic Cu-Rh nanoparticles on diazonium-modified carbon powders for the electrocatalytic reduction of nitrates**

Peyman Mirzaei\textsuperscript{1,2}, Stéphane Bastide\textsuperscript{1}, Atieh Aghajani\textsuperscript{2}, Julie Bourgon\textsuperscript{1}, Éric Leroy\textsuperscript{1}, Junxian Zhang\textsuperscript{1}, Youssef Snoussi\textsuperscript{1,3}, Asma Bensghaier\textsuperscript{1,4}, Ouezna Hamouma\textsuperscript{1,5}, Mohamed M. Chehimi\textsuperscript{1,*}, Christine Cachet-Vivier\textsuperscript{1,*}

\textsuperscript{1} Université Paris Est, ICMPE (UMR 7182), CNRS, UPEC, F-94320 Thiais, France.
\textsuperscript{2} MBA Water Treatment Chemicals Co., Ltd, N°9 Tadayyon Alley, Shariati St., Tehran, Iran.
\textsuperscript{3} Laboratory of Materials, Molecules and Applications, IPEST, University of Carthage, Sidi Bou Said road, B.P. 51 2070, La Marsa, Tunisia.
\textsuperscript{4} Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Chimie (Bio)Organique Structurale et de Polymères – Synthèse et Etudes Physicochimiques (LR99ES14), 2092 El Manar, Tunisia,
\textsuperscript{5} Laboratoire d’Electrochimie, Corrosion et de Valorisation Énergétique (LECVE), Faculté des Sciences Exactes, Université de Bejaia, 06000 Bejaia, Algeria.

\textsuperscript{1} XPS analysis of modified HSAG with immobilized nanocatalyst

Only one sample has been analyzed (ATP/HSAG=3.3 µmol/mg; Cu_{48}Rh_{52}) as most of the particles served for other physicochemical characterizations and electrocatalytic testing.

Figure SI-1 gives high resolution, peak fitted spectra of Cu_{48}Rh_{52}-decorated aryl-modified HSAG: (a) Cu2p\textsubscript{3/2}, (b) Rh3d\textsubscript{5/2}- Rh3d\textsubscript{3/2}, and (c) S2p.
Figure SI-1. High resolution, peak fitted spectra of Cu48Rh52-decorated aryl-modified HSAG: (a) Cu2p₃/2, (b) Rh3d₅/₂- Rh3d₃/₂, and (c) S2p.
TEM images of the synthesized composites for different rates of grafting (ATP/HSAG ratio)

The bimetallic composition is indicated in the images. The bimetallic NPs have been synthesized under the same conditions (dot-dash frame in Figure SI-2), except in the case of Cu$_{65}$Rh$_{35}$ (0 µmol/mg) where the metal salt concentrations are different.

Figure SI-2. TEM images of the synthesized Cu$_{100-x}$Rh$_x$/HSAG with and without grafted HSAG. The ATP/HSAG ratio (µmol/mg) used and the bimetallic composition are indicated. The frame (dash-dot grey line) corresponds to samples with bimetallic NPs synthesized under the same conditions.

It is difficult to get information from a simple view of these images. Several other TEM images (3 to 5) for each sample have actually been considered for the statistical analysis of the NP size distribution shown in this work. TEM images at higher magnification are presented in Figure SI-3 for each sample.
Figure SI-3. TEM images at higher magnification of the synthesized Cu_{100-x}Rh_x/HSAG with and without grafted HSAG. The ATP/HSAG ratio (µmol/mg) used and the bimetallic composition are indicated. The frame (dash-dot grey line) corresponds to samples with bimetallic NPs synthesized under the same conditions.