C. ROSSY, J. MAJIMEL, E. FOUQUET, C. DELACÔTE, M. BOUJTITA, C. LABRUGÈRE, M. TRÉGUER-DELABIERRE,* F.-X. FELPIN* (UNIVERSITÉ DE NANTES, UNIVERSITÉ DE BORDEAUX, TALENCE AND UNIVERSITÉ DE BORDEAUX, PESSAC, FRANCE)

Stabilisation of Carbon-Supported Palladium Nanoparticles through the Formation of an Alloy with Gold: Application to the Sonogashira Reaction

Sonogashira Coupling with Bimetallic Pd–Au Nanoparticles on Carbon

\[ \text{Pd(OAc)}_2 + \text{KAuCl}_4 \xrightarrow{\text{H}_2 (1 \text{ atm}), \text{charcoal}} \text{MeOH, 25 °C, 12 h} \xrightarrow{} \text{Pd–Au/C (1)} \]

\[ \text{R}_1^+ - \text{I} + \equiv \equiv \equiv \equiv \equiv \equiv \equiv \text{R}_2^+ \xrightarrow{\text{Pd–Au/C (2 mol% Pd)}} \text{K}_3\text{PO}_4, \text{i-PrOH–H}_2\text{O (1:1)} \xrightarrow{80 \degree \text{C, 20 h}} \text{R}_1^+ \equiv \equiv \equiv \equiv \equiv \equiv \equiv \text{R}_2^+ (2) \]

Selected results:

- 73% yield
- 70% yield
- 91% yield
- 68% yield
- 73% yield
- 70% yield
- 70% yield
- 87% yield

\[ \text{O} - \text{O} \]

\[ \text{O}_2\text{N} \]

\[ \text{OMe} \]

\[ \text{OMe} \]

\[ \text{S} \]

\[ \text{OMe} \]

\[ \text{O} \]

\[ \text{O} \]

Significance: Bimetallic palladium–gold nanoparticles on carbon (Pd–Au/C) were prepared by treatment of a mixture of Pd(OAc)_2, KAuCl_4 and charcoal in methanol with H_2 (eq. 1). Pd–Au/C catalyzed the Sonogashira coupling of aryl iodides with terminal alkynes under copper-free conditions to give the corresponding diaryl alkynes in up to 95% yield (18 examples, eq. 2).

Comment: The Pd–Au/C nanoparticles were characterized by TEM, XRD, STEM-EDX, XPS and CV analyses. Though the catalytic activity of fresh Pd–Au/C was similar to that of fresh Pd/C, Pd–Au/C showed high stability during the recycling experiments (eq. 3). TEM analysis showed that the morphology of the recovered Pd–Au/C was unchanged after the third run.