Palladium-Catalyzed Reductive Heck Reaction

Selected examples:

\[
\begin{align*}
\text{MeO} & \quad 86\% \text{ yield} \\
\text{Me} & \quad 87\% \text{ yield} \\
\text{F} & \quad 90\% \text{ yield} \\
\text{Me} & \quad 87\% \text{ yield} \\
\text{Me} & \quad 84\% \text{ yield} \\
\text{Ph} & \quad 82\% \text{ yield} \\
\text{MeO} & \quad 74\% \text{ yield} \\
\text{Me} & \quad 88\% \text{ yield} \\
\text{Me} & \quad 72\% \text{ yield} \\
\text{Me} & \quad 75\% \text{ yield}
\end{align*}
\]

Reactions performed with D\(_2\)O and B\(_2\)Cat\(_2\):

\[
\begin{align*}
\text{DH}_2C & \quad 68\% \text{ yield} \\
\text{F} & \quad 90\% \text{ yield} \\
\text{DH}_2C & \quad 63\% \text{ yield} \\
\text{Cl} & \quad 90\% \text{ yield} \\
\text{DH}_2C & \quad 67\% \text{ yield} \\
\text{Me} & \quad 90\% \text{ D incorporation} \\
\text{DH}_2C & \quad 64\% \text{ yield} \\
\text{Me} & \quad 93\% \text{ D incorporation}
\end{align*}
\]

Significance: Water represents the cheapest and most environmentally benign source of hydrogen or hydride; therefore, its use in combination with transition-metal catalysis is very appealing. In the present work, the authors present a palladium-catalyzed enantioselective reductive Heck reaction using water as final hydride donor.

Comment: \(N\)-Aryl acrylamides reacted in the presence of a [PdCl\(_2\)(MeCN)\(_2\)] catalyst and (S)-t-BuPHOX ligand to generate the corresponding products in good yields and good enantioselectivities using water as hydride source. The use of DABCO as a base and a catalytic amount of B\(_2\)(OH)\(_4\) was found to be crucial for the success of the transformation. The use of deuterium oxide allowed the synthesis of D-labeled oxindoles with >90% D incorporation.