Gold(I)-mediated C-H activation and decarboxylation processes

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Although popularly considered inert, gold salts are in fact remarkably reactive and able to promote a range of transformations. In particular, it has been known for over 80 years that gold(III) can perform the C–H activation of electron-rich aromatic compounds in a process resulting in the formation of a new carbon-gold(III) bond.1,2

In this paper we would like to report our work on the reactivity of gold(I) salts towards C–H activation processes. In stark contrast to gold(III) salts, gold(I) preferentially mediates C–H activation on electron-poor arenes. Under our reaction conditions arenes meta-disubstituted with two electron-withdrawing groups are C–H activated, with high regioselectivity, leading to the corresponding aryl-gold(I) complexes (Figure 1).3 Our preliminary mechanistic studies suggest that this process occurs via a concerted metallation deprotonation mechanism, mediated by a gold(I)-pivaloate intermediate.

Figure 1. Gold(I)-mediated C–H activation

In addition to C–H activation, gold(I) salts are able to mediate the decarboxylation process of a variety of aromatic carboxylic acids –bearing an electron-withdrawing or -donating group in ortho– and of heteroaromatic carboxylic acids –when the carboxylic acid is α to a heteroatom.4 As in the analogous C–H activation process, this methodology allows the synthesis of a variety of (hetero)aryl-gold(I) complexes in excellent yields (Figure 2).

Figure 2. Gold(I)-mediated decarboxylative activation

Both of these methodologies open the door to further gold(I)-mediated C–H activation and decarboxylation based transformations on aromatic compounds, and our recent work in this area will also be discussed. In particular, we will discuss the application of our gold(I) C–H activation methodology to the construction of C–C bonds.5

References

5. unpublished results