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Improving the selectivity of copper-catalysed dehydrogenative cross-coupling of H-phosphonate and amine through understanding the pathways to side-product formation

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PURPOSE OF THE ABSTRACT

Phosphoramidates (P-N) are a class of organophosphorus compounds that are useful in industries and in research due to their structure. For example, the O=P-N structural unit in MccC7,[1] among other products,[2] have shown antibacterial properties. The presence of a lone pair of electrons on N and O makes P-N good ligands for catalysis.[3] These complexes are also important additives for various materials to make them more flame retardant.[4] . Traditional synthetic routes of making P-N compounds involve multistep procedures, time-consuming pre-functionalisation, or defunctionalisation step(s), use of toxic reagents, and often generate stoichiometric amounts of waste. In an effort to be more sustainable, phosphoramidates have been synthesised via an environmentally-friendly dehydrogenative cross-coupling reaction using H-phosphonate and amine starting materials in the presence of a Cu catalyst.[5, 6] Although the procedure is cost effective and better for the environment, the reactivity of the H-phosphonate and the amine with the copper catalyst under aerobic conditions forms many unwanted side-products (Figure 1). Research towards understanding the routes to the side-products and as well as the possible mechanism of phosphoramidate formation will be discussed.

FIGURES

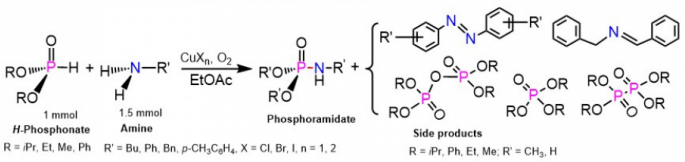

FIGURE 1

Fig. 1. Copper-catalysed dehydrogenative cross-coupling of reaction of H-phosphonate and amine

No legend

FIGURE 2

KEYWORDS

Phosphoramidate | mechanism | side-products | copper catalysis

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