EXPLORING THE ROLE OF BASES IN CARBOXYLATION OF GRIGNARD REAGENTS WITH CO$_2$

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The intrinsic high reduction potential of Grignard reagents allows facile formation of C-CO$_2$ bond to access carboxylic acids. However, an ideal chemical CO$_2$-functionalization reaction is yet to be developed because of the high thermodynamic stability and kinetic inertness of CO$_2$. Therefore, it is desired to develop a CO$_2$-activation catalyst – which would increase effective concentration of CO$_2$ in reaction medium, while decreasing LUMO energy of CO$_2$ to facilitate chemical process. To probe this, we designed a model study: Grignard reaction with carbon dioxide in the presence of basic catalysts, which are prone to interact with CO$_2$. Although the form of “carbamates” – CO$_2$ adducts of amine bases – exhibits $sp^2$ carbon, with the base as a leaving group, its action in substitution reactions is unclear.

We are quite curious about whether CO$_2$-adducts are more active or less active toward Grignard reagents.