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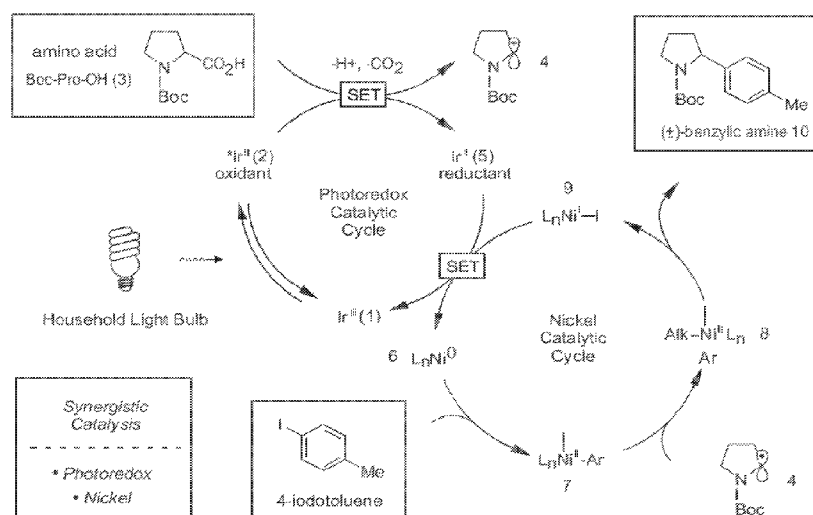


FIGURE 2

(57) Abstract: Methods described herein enable the production of numerous molecular species through decarboxylative cross-coupling via use of photoredox and transition metal catalysts. For example, methods described herein enable the production of numerous molecular species through decarboxylative cross-coupling via use of photoredox and transition metal catalysts. A method described herein, in some embodiments, comprises providing a reaction mixture including a photoredox catalyst, a transition metal catalyst, a coupling partner and a substrate having a carboxyl group. The reaction mixture is irradiated with a radiation source resulting in cross-coupling of the substrate and coupling partner via a mechanism including decarboxylation, wherein the coupling partner is selected from the group consisting of a substituted aromatic compound and a substituted aliphatic compound.