Fe-, Co- and Cu-Catalyzed Coupling Reactions Using \( \text{N}_2\text{O} \)

**Significance:** For the first time, \( \text{N}_2\text{O} \) (‘laughing gas’) is reported to undergo oxidative homo-coupling reactions of Grignard reagents in the presence of metal catalysts under mild reaction conditions. Whereas less than 1 mol% of \( \text{Fe(acac)}_3 \) and \( \text{CoCl}_2 \) showed to be superior in the homo-coupling reactions of arylmagnesium reagents, also alkyl Grignard reagents undergo oxidative homo-coupling reactions in the presence of \( \text{Li}_2\text{CuCl}_4 \).

**Comment:** The authors applied this new protocol also to oxidative cross-coupling reactions between \( sp^2\) - and \( sp^3\)-hybridized Grignard reagents. Therefore, \( \text{PhMgCl} \) and various primary and secondary alkyl Grignard reagents furnish the desired aryl-alkyl cross-coupling products in 59–83% yield.