This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research.

**Introduction**

*N,N*-Dimethylaniline (NNDMA, CAS: 121-69-7, Scheme 1) is colorless liquid with a boiling point of 193–194 °C. It is a simple but widely applied reagent. It is not only used as a starting material in the synthesis of dyestuffs, pharmaceuticals, agrochemicals, and fine chemicals, but also used as a solvent, stabilizer, and analytical reagent. The low price of NNDMA (due to the industrial production) has played an important role for its applications.

Scheme 1

In its original applications, NNDMA was used as a solvent, in electrophilic substitutions on the para-position of the benzene ring, and to prepare quaternary amines. However, in recent years, researchers have paid more and more attention to developing further applications, such as the reactions on the methyl groups attached to the nitrogen atom. According to the literature published in the last years, NNDMA can react with alkenes, alkynes, active methylene, and cyano groups. By C–C and C–N bond activation of NNDMA, nitrogen compounds can be constructed with reagents containing active hydrogens, and NNDMA can be used to prepare heterocyclic compounds by coupling reactions.

**Abstracts**

(A) *Activation of C–H Bond in N–Me:*
Using metal catalysts and oxidants, the C–H bond of the N–Me group of NNDMA can be activated and replaced by an unsaturated compound like an alkene, alkyn, CN, C=N, and active methylene. There are two N–Me groups on NNDMA, but a single C–H bond activation is much easier. With the above reaction, the intermediate compounds are obtained in high yield under mild conditions. Iron(II), copper(I), ruthenium, and iridium metal salts are usually used as the catalysts, and tert-butyl hydroperoxide (TBHP) or O₂ is used as the oxidant. The C–H bond in N–Me is activated, and the hydrogen atom can be replaced by peroxide, alcohol, and phosphoric acid ester groups.

(B) *Activation of N–C Bond in N–Me:*
By C–N bond cleavage, amide, N-nitrosamines and other nitrogen-containing compounds can be prepared under mild conditions in high yield. The methyl group can be replaced by an acetyl group with FeCl₂ and tert-butyl hydroperoxide, and it can be replaced by NO with o-iodoxybenzoic acid (IBX), nitromethane, and RₓNX (X = halide). With diazooacetate and FeCl₃, the methyl group can be replaced by an acetate group. Cytochrome P450 enzymes can achieve demethylation of NNDMA.
References