FORMATION OF THIOUREAS BY REACTION OF ISOThIOCYANATES WITH WEAKLY BASIC OR BETaine AMINES PROMOTED BY DMAP

P. Pazdera\textsuperscript{a,b}, J. Šimbera\textsuperscript{a}, K. Sedláček\textsuperscript{b} and J. Havel

\textsuperscript{a}Department of Organic Chemistry, Masaryk University Brno, Kotlářská 2, CZ-611 37 Brno, Czech Republic
\textsuperscript{b}Comin.cz, s. r. o., Táboritská 23, Prague, CZ-130 87, Czech Republic
\textsuperscript{c}Department of Analytical Chemistry, Masaryk University Brno, Kotlářská 2, CZ-611 37 Brno, Czech Republic

It is generally known that an activation of acyl, alkoxy carbonyl or aryloxycarbonyl synthons for their coupling with N, O, C nucleophiles may be very effectively realized by an addition of 4-\(N,N\)-dialkylaminopyridine (DMAP) \[1\].

On the other hand, formation of thioureas is not easy for reactions starting from small reactive isothiocyanates (e. g. alkyl-, electron donor substituted aryl- or heteroaryl isothiocyanates) and/or weakly basic or betaine amines. The last mentioned betaines are insoluble in non-polar organic solvents and reactions must be frequently carried out for the most part in two phase systems with poor yields.

Now we found that these problems can be solved under a promotion by DMAP addition to both reacting components. Syntheses can be realized successfully for small active isothiocyanates and/or weakly basic amines in different organic solvents, for betaine amines, i. e. 2-, 3-, 4-ammonioalkyl carboxylates and sulfonates in two phase systems consisting buffered water and organic solvent. Under this condition the thioureas are formed fast and in very good yields. This observation enables an application of the method for final determination of amino acids, proteins and related compounds after their separation by spectrophotometric or luminescent analytical methods.

In our contribution an application range will be discussed for both isothiocyanate and amine components. An explanation of the reaction course can be given as follow.

\[ \text{R}_N\text{C} = \text{S} + \text{DMAP (0.1 mol\%) \rightarrow R}_N\text{S}^- \text{N} + \text{NCH}_3\text{CH}_3 \text{organic phase} \]

\[ \text{organic phase} \]

\[ \text{ArNHR}^- + \text{DMAP} \rightarrow \text{[I]} \]

\[ \text{[I]} \]

\[ \text{[I]} \]

\[ \text{DMAP} + \text{R} = \text{alkyl, aryl, heteroaryl} \]

\[ \text{Ar} = \text{aryl, heteroaryl} \]

\[ \text{R}' = \text{alkyl, aryl} \]