



Amino group immobilized on polyvinyl alcohol as a reusable catalyst for highly accelerated *N*-formylation of amines using formic acid under solvent-free condition

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Formyl group as an important intermediate in the preparation of amine derivatives, also functions as the most useful and versatile amino-protecting group in peptide synthesis [1]. Numerous methods of formylation are reported in the literature. However, there are several factors in some of these methods which limited their applications. As the ideal methods of synthesis are those, in which the reactions should be carried out with high productivity under mild conditions which are not detrimental to the environment [2], development of green, available, low cost, eco-friendly and recyclable catalyst systems is of current interest [3]. Reagents immobilized on organic polymers [4] have been instrumental in the development of automated parallel synthesis of chemical libraries. Thus, there is a drastic need to develop an environmentally benign, clean, simple and practical method for the *N*-formylation of amines under mild conditions.

R-NH-R +
$$H \xrightarrow{O} OH$$
 $\frac{PVA-(CH_2)_2NH_2}{40 \ ^{\circ}C; \ solvent-free} \xrightarrow{R} N \xrightarrow{H} H$
R= Aryl, Alkyl, Heteroaryl
R'= H. Alkyl

References:

[1] Martinez J.; Laur J. Synthesis 1982, 979-981.

[2] Anastas, P. T.; Williamson, T. C. in: *Green Chemistry, Frontiers in Benign Chemical Syntheses and Processes., Ed.,* Oxford University Press, California, 1998.

[3] Zhang, Q.; Zhang, S.; Deng, Y. Green Chem. 2011, 13, 2619-2637.

[4] Kirschning A.; Monenschein H.; Wittenberg R. Angew. Chem., Int. Ed. 2001, 40, 650-679.