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Synthesis of Pyrrolidones and Quinolines from the Known Biomass Feedstock Levulinic Acid and Amines

Carmen Ortiz-Cervantes, Marcos Flores-Alamo and Juventino J. García*

Facultad de Química. Universidad Nacional Autónoma de México. México D. F. 04510 México

juvent@unam.mx

Abstract

The catalytic conversion of biomass-derived compounds into value-added products such as food additives, agrochemical components and pharmaceutical formulations, is a promising and cost effective synthetic strategy. Here, we describe the synthesis of a variety of *N*-(alkyl, aryl)-5-methyl-2-pyrrolidones through the reductive amination of levulinic acid using formic acid as the hydrogen source. This system is catalyzed by 3.8 nm ruthenium nanoparticles that were prepared by thermal decomposition of $[Ru_3(CO)_{12}]$ in solvent-free conditions. When the reactions were carried out without the catalyst, the pyrrolidones were obtained with low yield and poor selectivity. In addition, the reaction between levulinic acid and 2-ethynylaniline produced 2-(2,4-dimethylquinolin-3-yl) acetic acid (**8**) in mild and metal-free conditions with good yield. Furthermore, the synthesis of substituted quinolines was achieved through a condensation reaction between levulinic acid and different 2-alkynylanilines promoted by *p*-toluenesulfonic acid, this method is highlighted as a novel procedure for preparation of quinolines.

Keywords: amines; cyclization, heterocycles, levulinic acid; quinolines; reductive amination; ruthenium nanoparticles.