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Synthesis of 5-hydroxymethylfurfural from amino sugars under mild conditions

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The lignocellulose-based biomass has been reported as a potential source for the synthesis of 5-hydroxymethylfurfural (5-HMF), which is a precursor of liquid fuels and valuable furan derivatives. The exploitation and conversion of lignocellulosic biomass might be limited to the availability of agricultural land so our research group has been focused to the exploration of amino sugars as an alternative source for the synthesis of 5-HMF. D-glucosamine is an amino carbohydrate that constitutes the structure of one of the most abundant biopolymers, chitin, and its derivative chitosan. Therefore, our first goal was the conversion of D-glucosamine into 5-HMF. The synthetic strategy was different from the acid-catalyzed dehydration of D-glucose as previously reported by us. Attempts to convert D-glucosamine into 5-HMF involved a one-pot process of three reactions: nitrosative deamination, nucleophilic substitution of the diazonium ion by water, and acid-catalyzed dehydration. 5-HMF was obtained in moderate to good yields under mild conditions using water as main solvent and dimethyl sulfoxide to assist the dehydration step. Nitrosative deamination and dehydration reactions of D-glucosamine were also performed using 1, 2-dichloroethane as main solvent obtaining 5-HMF in moderate yields. The reactions were carried out with temperatures in the range of 70-100 °C for 24 hours. The optimum reaction to convert D-glucosamine into 5-HMF was extrapolated to the transformation of the amino polysaccharide, chitosan, obtaining 5-HMF in good yields. To the best of our knowledge, this is the first oriented synthesis of 5-HMF from amino sugars and could be eventually used to the exploitation of crustaceous wastes.

Biography

Abraham Garcia has completed his PhD at the age of 28 years from National Autonomous University of Mexico and postdoctoral studies from Polytechnique Institute of Mexico and Vienna University of Technology. He is now a researcher at the National University of Nuevo Leon. He has published more than 10 papers in reputed journals and has been a referee for several journals.

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