Carbon nanoparticles from local biomass for tribological applications First results

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Friction and wear phenomena are the main causes of the decrease in performances and durability of mechanical systems. Manufacturing techniques for metal parts must meet the growing economic demands of the market, such as improved material durability, reduced maintenance costs and energy consumption. The use of tribology is essential and constitutes an important economic issue.

Pure lubricating bases (mineral or synthetic oil) cannot provide all protective functions, so that additives are added to improve their reducing properties of friction and wear. New lubrication strategies use dispersed colloidal particles in lubricants. The approach is to supply the sliding contact with solid particles, which can instantly form the tribological film.

My thesis project focuses on the synthesis of new friction reducer additives from local biomass, in order to produce ecofriendly lubricants. These new carbon phases are obtained using the spray-pyrolysis technique[1] with sugarcane from local biomass. It consists in nebulizing a solution of saccharose in the form of micro-droplets, transported to a tubular oven heated at temperatures ranging from 800°C to 1000°C.

The first results have permitted to see the effects of the different synthesis conditions, i.e. oven temperature, catalyst concentration and carrier gas pressure, using scanning electron microscopy to observe the spherical shape and the porosity of the particles. This part will concern the tribological properties of our particles, measured with a sphere/plan contact tribometer. The effect of an annealing process on these particles will also be studied.

[1] Maria E. Fortunato, Massoud Rostam-Abadi, and Kenneth S. Suslick, Nanostructured Carbons Prepared by Ultrasonic Spray Pyrolysis, Chemistry of Materials Communication