Department of Chemistry
Departmental Seminar Series

You are cordially invited to a lecture presented by

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Date: Monday, 29th July 2019
Time: 11:30
Venue: Mendeleev, Chemistry Building
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Electrocatalytic Reduction of Carbon Dioxide on Carbon Supported Copper Based Nanomaterials

Carbon dioxide (CO_2) is one of the major contributors to the greenhouse effect and its atmospheric concentration is growing exponentially. As HCOOH is a viable energy source facile to be stored, CO_2 - to-HCOOH conversion is a promising route, which can combine the utilization of renewable electricity generated from intermittent sources for decreasing significantly the environmental impact. It is also known that electrochemical CO_2 reduction mainly depends on the electrode material and its composition, the nature of the electrolyte and its pH value, and of course the applied electrode potential. For this seminar, various binary compositions of carbon-supported electrocatalysts based on Cu and Pd, synthesized from polyol method, will be addressed. The obtained electrode materials were characterized physicochemically to evaluate their elementary and chemical

composition, crystallographic structure and particle size. A comparative study of the carbon dioxide conversion on the prepared Cu-Pd cathodes was performed under low gas pressure and ambient temperature. Constant potential electrolysis experiments were carried out in a divided H-type two compartment cell with a Nafion ® 117 ion-exchange membrane equipped with both gas inlet and outlet. The gaseous products of the CO_2 reduction were analyzed on-line above the electrolyte with micro-gas chromatography (µ-GC), while the reaction products in the aqueous phase were identified and quantified through complementary ex situ analytical techniques (HPLC, UV-vis and 1 H NMR). It was found that the hydrogen evolution (HER) is the competing reaction, and carbon monoxide (CO) was formed according to the catalyst surface composition. The optimization of the atomic ratio of the Cu x -Pd 100-x /C material, those of the electrode potential and the charge loading permitted to lower the HER, to suppress the CO production, and importantly, to selectively orientate the CO 2 conversion to HCOOH.