**Nitrogen Fixation: Unveiling the plasma-based route**

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**Abstract:**  Low pressure plasmas can be used for gas phase activation via electron-molecular reactions producing ions, radicals, metastables and photons that can be beneficial for catalysis of several technologically important reactions. When used along with heterogeneous catalysts, the plasma activation could result in the enhanced processing of the gas input stream, or the plasma catalytic effect. As compared to traditional catalysis which consists of adsorption, surface chemical reaction and desorption, plasma catalysis approach uniquely provides the generation of active species in the gas phase readily available to interact with the catalyst. Currently, the use of plasma has emerged as one of the most promising alternatives to perform several reactions of great environmental importance, such as the CO2 reduction reaction, recently reported. However, for the case of plasma-catalyst combined effect (plasma catalysis) it is not clear whether one needs the same type of catalyst materials as for neutral gas environments or not. In this presentation, I will discuss the radio-frequency (RF) plasma-catalyst pathway to reach yields higher than the commercial Haber – Bosch synthesis;  19% when using Au as catalyst. Furthermore, for the first time the ammonia synthesis at mild conditions with a catalyst never employed for this purpose, such as molten Ga was studied. We also explored conventional transition metals for this reaction, such as Cu, Fe, Pd, Ag, Au. Interestingly, when the catalyst is placed under plasma environment its synergism with plasma enable it to overcome the wall effect leading to the reaction happening on the catalyst instead of on the reactor wall. Furthermore, we observed an interdependence between the ammonia yield and the hydrogen content when a catalyst is employed; concluding that hydrogen recombination coefficient has a direct impact on the ammonia yield.

The plasma-based route for the synthesis of ammonia can result in an attractive alternative route for ammonia production, especially at small scale. Furthermore, plasma technologies have the potential to store efficiently renewable electricity since they require short reaction times and reactors can be easily switched on/off, being ideal to adapt to the intermittent supply of sources such as wind and solar.

**Biography:**

**Maria Carreon** is originally from Mexico. Sheobtained her PhD degree in Chemical Engineering at University of Louisville. Since the Fall 2015 she is Assistant Professor in the Chemical Engineering Department at University of Tulsa. Her research interests centers on the rational design of nanomaterials (including nanowires, ordered porous oxides, zeolites and Metal Organic Frameworks, MOFs) for diverse functional applications. Her current specific research areas include: Growth mechanisms on Si and Ge nanowires, synthesis of Si and Ge thin films via CVD and PECVD (Plasma Enhanced CVD), Aluminosilicates and zeolite membranes for carbon dioxide capture, mesoporous oxide photocatalysts, synthesis of nanomaterials for lithium ion batteries and interaction mechanisms between plasma, molten metals and porous materials to apply to the plasma catalysis technique. Carreon awards include first recipient of the Conn Center Fellowship at University of Louisville and two National Kokes awards (given by the North American Catalysis Society). She is member of the Mexican National Researchers System.

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