Story of a fruitful scientific collaboration between France and Texas: Drs. Estève (Fr) and Chabal (U.S.) join forces

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Born in the early 2000s from the encounter of **Dr. Alain Estève**, postdoctoral fellow at the Bell laboratory at Murray Hill, New Jersey, and **Dr. Yves Chabal**, Professor at the same laboratory, the collaboration between the two researchers has grown since and survived employment changes. Currently, Dr. Estève is **Researcher at the Laboratory for Analysis and Architecture of Systems, LAAS**, a CNRS research unit in France, and Dr. Chabal is **Professor of Material Sciences, director of the Laboratory for Surface and Nanostructure Modification (LSNM) and Head of the Department of Material Sciences and Engineering at the University of Texas at Dallas**.

The strength of their collaboration lies in the complementarity of their research: Dr. Estève expertise is in the multi-scale modelling while Dr. Chabal expertise is on in situ experimental technics (in particular spectroscopies). The combination of both expertises then allows the determination and the understanding of surface microscopic mechanisms involved in nanotechnologies and the associated processes.

(from L to R): Yves Chabal, Alain Estève

***Top** (from L to R): Gaurav Rao, Dale Soney, Perrine Mathieu, Don Dick, Wilfredo Cabrera, Dr. Yves Chabal, Nour Nijem, Collin Chiles, Saeedeh Ravandi, Abraham Vega, Karla Bernal Ramos, Weina Peng, Tatiana Peixoto, Chenglong Jiang, Cheng Gong, Dr. Guylhaine Clavel, Kui Tan, Dr. Jean Francois Veyan*
***Bottom** (from L to R): Ryan Harmon, Tyson Bartlett, Nikhil Karnik, Christian, Dr. Oliver Seitz, Dr. Katy Roodenko, Dr. Jinhee Kwon, Louis Caillard, Irinder Chopra*

Collaboration timeline

- **2000**: Jointly basic research on silicon oxidation.

- **2004-2006**: Join project "*High-k dielectric film deposition characterization*" in the framework of a NSF/CNRS join program. This project enabled the extension of their initial work on silicon oxidation to the interaction of more complex molecules such as organometallic precursors.

- **2009-2013**: Join project "*MOdelling of nanoenergetic Materials* (MOMA)" in the framework of the **Partner University Fund (PUF)**, a program of the Embassy of France in the United-States. This join project funded student exchanges at the Master and PhD levels between the two laboratories and was focused on the modelling of energetic materials. With this support, the collaboration was able to bring new understandings on the formation of reactive interfaces such as Al-CuO.

- **2013-2016**: In 2013, an **International Associated Laboratory (CNRS program) named ATLAB (Accelerated Technology Laboratory)** has been created in Dallas for a period of 3 years. In addition, the creation of ATLAB, which specifically finances researchers and students mobility, allowed the researchers to get an **ANR/NSF join project**. The research conducted within the ANR/NSF join project aims to pursue the work on Al-CuO interfaces initiated within the PUF MOMA project and to understand DNA-(silicon or metallic surfaces) assembly mechanisms.

An illustration of a surface nanopattern. In 2010, Chabal and colleagues discovered that immersing hydrogen-terminated silicon (111) surfaces in methanol resulted in a nanopattern of methoxy that could be transformed into F (as shown here) and then OH groups.

Future project

In view of these fruitful scientific collaborations initiated more than 10 years ago, with publications in well-known journals such as “Nature Materials”, the partners wish to implement an innovative interdisciplinary join training program focused in advanced nanotechnologies in relation with their common scientific interests.