



## Advances in Surface Characterization of Plasma-Functionalized Biomaterials: Application to PTFE

Gaétan Laroche, PhD  
Laboratoire d'ingénierie des surfaces  
Centre de Recherche du Centre Hospitalier Universitaire de Québec  
Département de génie des mines, de la métallurgie et des matériaux  
Université Laval

Synthetic biomaterials of polymer origin have been used for several decades to produce devices aimed at supplementing certain biological functions or outright replacing tissues or organs in the human body. While the initial goal was simply to find a replacement material, clinical experience first guided research toward the development of stealth materials, eventually leading to a focus on proactive interactions with the physiological environment. Among these materials, PTFE (polytetrafluoroethylene) holds a prominent position, being used in a large number of biomedical devices across various fields of regenerative medicine.

This presentation will discuss the evolution of approaches developed in our laboratory for characterizing the surface of polymer materials functionalized by plasma, specifically polytetrafluoroethylene (PTFE). Initially based on a trial-and-error strategy, the method now implemented takes advantage of powerful statistical methods to deduce the physicochemical properties of treated surfaces from the experimental parameters used to generate the plasma and from near-infrared emission spectroscopy measurements within the discharge. An example of an application of plasma-functionalized PTFE surfaces will be presented, illustrating their use in promoting endothelialization of medical devices intended for implantation in contact with blood.

**Biographic note:** Professor Laroche earned his PhD in Chemistry from Université Laval in 1990. He conducted postdoctoral research at the Defense Research Establishment in Valcartier, focusing on infrared emission spectroscopy of hot sources. In 1992, he joined the St-François d'Assise Hospital Research Center. From 1994 to 2002, he was a researcher with the Quebec Health Research Fund (FRQS) and an assistant/associate professor at Université Laval's Faculty of Medicine. Since 2002, he has been a full professor in the Department of Materials Engineering at Université Laval. He served as department head (2005–2009) and led several research programs, including a national CREATE program in regenerative medicine. His work focuses on surface engineering to improve biomaterial biocompatibility. He has co-authored over 150 peer-reviewed papers, given 200+ conference talks, and holds six patents. He was named a Fellow of Biomaterials Science and Engineering for his career achievements.