

The Tribochemistry Award

Presented to

Dr. Jean-Michel Martin

In recognition of his outstanding contribution to tribochemistry by The Tribochemistry Technical Committee (Chair: Dr. Keiji Nakayama), Japanese Society of Tribologists (JAST) in September 2019 in “Tribochemistry Hakodate 2019”.



Jean Michel Martin was born in Burgundy, France, in 1948. From 1968 to 1973 he read from University of Lyon as a chemical engineer and then as a surface chemist. He joined the Laboratory of Tribology at Ecole Centrale de Lyon in 1974 in the Material Sciences Department. He studied for a PhD under the supervision of Professor Jean-Marie Georges. He obtained his PhD in 1978 for a research entitled “*Anti-wear chemistry of zinc dithiophosphates*”. He has continued to teach and conduct research in boundary lubrication and becomes a full Professor in 1988 and a distinguished Professor in 2008. He became a member of the “University Institute of France” in 2001.

His career has been entirely devoted to tribology. He has more than 45 years of extensive experience in fundamental and applied research in tribology of thin films, gas phase lubrication, diamond-like coatings, boundary lubrication, anti-wear and extreme-pressure additives, friction modifiers and surface chemical analysis.

As a surface chemist, Professor Martin first research topic was the anti-wear mechanisms of zinc dithiophosphate. Since his PhD on this topic in 1978, He never stopped continuing this research field. In 1999, He introduced the Chemical Hardness concept to explain how abrasive wear is inhibited by the tribochemical reactions of ZDDP in steel contacts. Later, He studied multi-additive lubricants, friction modifying additives (MoDTC), overbased detergents and synergistic and/or antagonist effects between all these different additives.

In 1993, He discovered superlubricity of pure molybdenum disulphide MoS_2 in ultrahigh vacuum. Since this date he never stopped studying how to reach superlubricity (friction coefficient below 0.01) in practical situations, including in presence of a liquid lubricant under boundary conditions. In 2004, a new discovery was made of superlubricity of diamondlike coatings in presence of ester of polyols.

Professor Martin has developed a new lubricant technology containing no heavy metals, no phosphorous and sulfur and no toxicity. Green lubricants were optimized for DLC coatings (mainly ta-C). Results lead to several papers and 8 patents in collaboration with Japanese companies. The result was the mass production of such carbon coatings for the Asian market (more than one hundred millions engine parts coated since 2006).

A book “superlubricity” was edited in 2007 on this topic (with Ali Erdemir from Argonne USA) and a second edition will be delivered in 2019.

In the 2000’s, Professor Martin studied nanoparticles as lubricant additives because they do not need temperature to be activated. Many materials were systematically investigated: bucky balls, nanotubes, carbon onions, fullerenes etc. Mechanisms of action of nanolubricants were optimized for industrial applications. A book on this topic “Nanolubricants” was co-edited with Nobuo Ohmae from Kobe University.

From his education as a surface chemist, Professor Martin tried to implement new analytical techniques for tribofilm analyses (XPS/AES/ToF-SIMS, XANES, Raman etc.). He published the first paper using synchrotron radiation applied to lubrication studies.

In 2005, He pioneered the use of computer simulations in lubrication studies and particularly molecular dynamics (MD) coupled with quantum chemistry (QM). He has developed several collaborations with Japan (Tohoku University), Italy (University of Modena) and US (Caltech). Nowadays, computer simulations are routinely used in papers dealing with tribochemistry.

Since his retirement from ECL in 2012, Professor Martin is an emeritus professor who never stopped research so that he has several PhD students under his supervision.

Professor Martin had had many international collaborations and research contracts with car manufactures: Renault (France), Ford (US) Nissan and Toyota (Japan) and with lubricant suppliers: Total (France), Idemitsu and Nippon Oil Co., (Japan).

Throughout his carrier Professor Martin has published more than 300 referred papers and has received the “Bunshan Award “at ICMCTF in San Diego and the Carlos Gohn Award in 2007 He has written 10 book chapters and has 12 international patents.

Dr. Martin has contributed to the ITCs and WTCs satellite forums on Tribochemistry for long years from the first time in Tokyo 1995 to Hakodate 2019.

He is indeed a worthy recipient of the world’s highest honour in tribochemistry – The Tribochemistry Award for 2019.