



Prof. Bruno Ameduri

”Challenges and Issues of Fluoropolymers”

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godz. 10:00

sala 2.61, Wydział Chemii UAM

Wykład w formie tradycyjnej

**WYKŁAD ODBYWA SIĘ
W RAMACH PROJEKTU**

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Fluoropolymers [1-6] are niche macromolecules that possess variable morphologies (ranging from thermoplastics to elastomers, thermoplastic elastomers and can be semi-crystalline or totally amorphous). Their exceptional properties mainly arise from the high electronegativity of the fluorine atom, from the small Van der Waals radius (1.32 Å) that induce a strong and short C-F bond (the dissociation energy of which is 485 kJ.mol⁻¹) and a low polarisability. Hence, fluorinated plastics that contain a high percentage of fluorine exhibit unique combination of properties such as very high thermal, chemical, aging and weather resistances, a high chemical inertness (to solvents, hydrocarbons, acids, and bases), low surface energies (as evidenced by repellent effect to oils and water), low dielectric constants, refraction indices, dissipation factors, flammability, and moisture absorption. Moreover, the presence of the strong C-F chemical bond has a crucial impact onto the high resistance to oxidation and hydrolytic stability.

Thus, these specialty polymers [3-7] have found many applications in building industries (paints and coatings resistant to UV and graffiti), chemical industries (high performance membranes), petrochemicals and **automotives**, aerospace and aeronautics (elastomers used as packings, O-rings or diaphragms devoted for extreme temperatures close to liquid hydrogen or hydrazine tanks in the boosters of space shuttles), for optics (cores and claddings of optical fibers), textile, fabrics or

stone treatments, (particularly coatings of old monuments), microelectronics, and for Energy (**lithium ion batteries** and **fuel cell membranes**). In spite of their high price, (linked mainly to unusual process of (co)polymerization, to additional cost of purification of gaseous monomers and to small volumes of production), these polymers find numerous developments in modern High Technologies. This presentation aims at showing the advantages and also few issues of these fascinating materials.

References:

1. Scheirs, J., *Modern Fluoropolymers*, Wiley, New-York, **1997**.
2. Hougham, G., Cassidy, P.E., Davidson, T. et K. Johns, *Fluoropolymers: Synthesis and Applications*, Plenum Publ., New-York, **1999**.
3. a) S. Ebnesajjad; *Fluoroplastics*, Plastic Design Library Series, Norwich, New-York, **2003**; b) S. Ebnesajjad; *Fluoroplastics, Volume 2: Melt Processible Fluoropolymers; The Definitive User's Guide and Databook*, William Andrew Publishing, Norwich, New-York, **2003**.
4. Ameduri, B. et Bortevin, B. *“Well-Architected Fluoropolymers : Synthesis, Properties and Applications”*, Elsevier, Amsterdam, **2004**.
5. Moore A.L.; *“Fluoroelastomers Handbook”*, PLD Publishers, Norwich, N.Y., **2006**.
6. Ameduri, B.; *Progr. Polym. Sci.*, 133, **2022**, 101591.
7. Ameduri, B., Fomin S. *Fascinating Fluoropolymers and Applications* Elsevier, Oxford, **2020**.



Figures: several items containing, coated, or based on fluoropolymers