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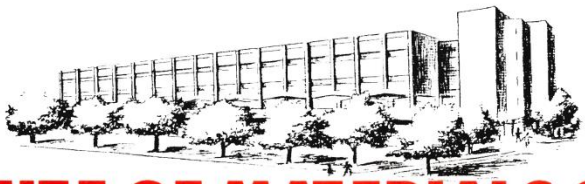

INSTITUTE OF MATERIALS SCIENCE

POLYMER PROGRAM SEMINAR

"Challenges and Issues of Fluoropolymers"

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Centre National de la Recherche Scientifique (CNRS)
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Friday, October 7, 2016
11:00 AM, IMS Room 20

ABSTRACT

Fluoropolymers [1-7] are niche macromolecules that possess variable morphologies (ranging from thermoplastics to elastomers, thermoplastic elastomers and can be semicrystalline 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 polarizability. 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 repellant 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.

(For references & bio, see next page).

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Dr. Bruno Ameduri (DR CNRS Senior Researcher) leads the "Fluoropolymers and Energy" team at the "Engineering and Macromolecular Architectures" Team of Institute Charles Gerhardt in Montpellier, France. His main interests focus on the synthesis and the characterization of fluorinated monomers (including cure site monomers, telechelics, and polyfunctional ones), telomers, and copolymers for various applications such as F-surfactants, F-elastomers, F-coatings, and polymers related to energy (fuel cell membranes-protonic, alkaline and quasianhydrous ones-, polymer gel electrolytes for Li-ions batteries, piezo-, ferro- or electroactive films, and PV).
Coauthor of two books, ca. 40 reviews or chapters of books, 280 peer review publications and coinventor of more than 70 patents, he is also a member of the American and French Chemical Societies and is a member of the Editorial Boards of the *Journal of Fluorine Chemistry*, *European Polymer Journal*, *Polymer Bulletin*.


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