



PROPOSTA DI TESI MAGISTRALE

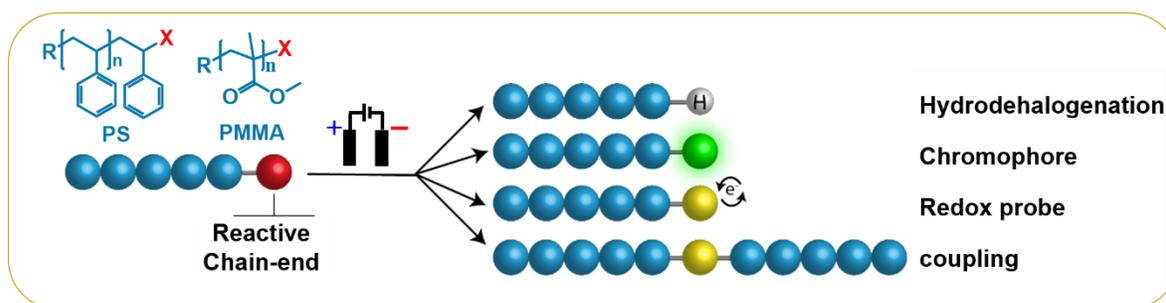
per studenti di Chimica, Chimica Industriale e Scienza dei Materiali

Electrochemical Shaping of Polymer Chain-Ends: Application to Polymers Prepared by Atom Transfer Radical Polymerization

Atom transfer radical polymerization (ATRP) enables the precise synthesis of polymers with well-defined architectures, controlled molecular weights, and low dispersity. It is used for the synthesis of advanced specialty polymers for a large variety of applications. A fundamental prerequisite of ATRP is the establishment of an equilibrium between propagating radicals, P_n^* , and dormant species, P_n-X ($X = Cl$ or Br), mediated by a catalytic system via atom transfer. Therefore, the obtained polymer carries an ω -halogen end-group, which may be undesirable in many applications because of the chemical reactivity of the carbon-halogen moiety and its thermal instability.

The chain end-group can be either modified to obtain a functionalized polymer or simply removed, and, indeed, various strategies have been developed for chain-end modification. Among them electrochemistry stands out as a powerful tool for its ability to perform well-controlled and selective reduction or oxidation reactions.

The thesis project aims to develop electrochemical approaches to modify terminal C-X groups in polymers. Different types of polymers, such as polystyrenes, polyacrylates and polymethacrylates, will be prepared by ATRP techniques. Then electrochemical techniques via direct or mediated electrolysis will be used to remove the halogen end-group. Particular focus will be on reaction conditions to achieve (i) hydrodehalogenation of the chain end, (ii) coupling polymer chains to shape their molecular weight distribution, and (iii) polymer modification to incorporate new functional groups.



During the development of the thesis project, you will have the opportunity to acquire good knowledge of some essential electrochemical techniques such as voltammetry, chronoamperometry and bulk electrolysis, and various analytical techniques to characterize polymers before and after chain-end modification.

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