Synthesis of Functional Polymeric Materials and Sustainable Catalysis

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The research unit is active in the following topics:

1) *Synthesis of nanostructurated materials by metal catalyzed polymerization processes.* Stereoregular polystyrene-*b*-polybutadiene copolymers (sPSB) were selectively functionalized with sulfonic group using a novel synthetic route. Morphological control was found in spin coated samples which enables good proton conductivity through the film. Novel diblock copolymers are produced using a click chemistry approach or sequential polymerization. Syndiotactic Polystyrene macromonomers, properly end functionalized, are coupled with polymer segments of polar monomers to yield novel amphiphile diblock copolymers. Monomers by renewable resources were polymerized via ATRP or ROP techniques to yield novel functional polymers.

2) *Selective oxidation of alcohols catalyzed by gold nanoparticles.* Gold nanoparticles incarcerated in a nanoporous host polymer matrix have been successfully synthesized and explored as active catalyst in selective alcohol oxidation under eco-sustainable conditions. Innovative reaction patterns for the one pot synthesis of esters and amides from selective alcohol oxidation in the presence of alcohols and amine is currently under investigation. The oxidation mechanism operated by gold nanoparticles has extensively studied.

3) *Inorganic sensors and dosimeters for biologically relevant anions.* Sensors with appropriately structured coordination sites have been developed for fluorescence sensing of biologically relevant anions. A new zinc complex was used for the selective detection of ADP and ATP in water. A cobalt peptide deformylase (Co-PDF) was proved to be an efficient fluorescence energy-transfer-based sensing device for monohydrogensulfide anion (HS⁻).

Keywords: Sustainable Catalysis; Olefin Polymerisation; Metal Nanoparticles.
SELECTED PUBLICATIONS

R. Pastorino, C. Capacchione, R. Ferro, S. Milione, A. Grassi

A. Buonerba, C. Cuomo, V. Speranza, A. Grassi
“Crystalline Syndiotactic Polystyrene as Reinforcing Agent of cis-1,4-Polybutadiene Rubber”
Macromolecules 2010, 43, 367-374

M. Strianese, S. Milione, C. Pellecchia, A. Grassi
“Heteroscorpionate Based Co^{2+}, Zn^{2+} and Cu^{2+} Complexes: Coordination Behavior, Aerobic Oxidation, and Hydrogen Sulfide Detection”

A. Buonerba, C. Cuomo, S. Ortega Sánchez, P. Canton, A. Grassi
“Gold Nanoparticles Incarcerated in Nanoporous Syndiotactic Polystyrene Matrix as Novel and Efficient Catalyst in Alcohols Oxidation”

“1,3-Double Siloxo-Bridged Zirconium Metallocene for Propene and 1-Hexene Regioselective Oligomerization”
Organometallics 2012, 31(5), 2108-2111.

I. D’Auria, M. Lamberti, M. Mazzeo, S. Milione, G. Roviello, C. Pellecchia
“Coordination Chemistry and Reactivity of new Zinc complexes Supported by a Phosphido Pincer Ligand”
Chemistry - A European Journal 2012, 18, 2349 – 2360

M. Lamberti, I. D’Auria, M. Mazzeo, S. Milione, V. Bertolasi D. Pappalardo

M. Strianese, S. Milione, A. Maranzana, A. Grassi, C. Pellecchia

M. Strianese, G. J. Palm, S. Milione, O. Kühl, W. Hinrichs, C. Pellecchia
“A FRET enzyme-based probe for monitoring hydrogen sulfide”
SUPPLEMENTARY MATERIAL

Detailed list of the components of the research groups
(permanent staff, included graduated students and postdocs)

<table>
<thead>
<tr>
<th>Name</th>
<th>Surname</th>
<th>Position *</th>
<th>Affiliation</th>
</tr>
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<tbody>
<tr>
<td>Grassi</td>
<td>Alfonso</td>
<td>PO</td>
<td>Università di Salerno</td>
</tr>
<tr>
<td>Milione</td>
<td>Stefano</td>
<td>RU</td>
<td>Università di Salerno</td>
</tr>
<tr>
<td>Capaccione</td>
<td>Carmine</td>
<td>RU</td>
<td>Università di Salerno</td>
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<tr>
<td>Buonerba</td>
<td>Antonio</td>
<td>PoD</td>
<td>Università di Salerno</td>
</tr>
<tr>
<td>Ortega Sanchez</td>
<td>Sheila</td>
<td>PhD</td>
<td>Università di Salerno</td>
</tr>
</tbody>
</table>

*: PO = full professor; PA = associated professor; RU = university researcher; PhD = graduated student; PoD = postdoctoral fellows; RC = CNR staff; T = technician

Apparatus
(minimum value 25,000 € per item)

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<th>Type</th>
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<td>Glass reactor for reactions under pressure</td>
<td>Büchi</td>
<td>2000</td>
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<tr>
<td>Steel Autoclave for high pressure reaction</td>
<td>PARR</td>
<td>2007</td>
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<td>Glove box for manipulations under an inert atmosphere</td>
<td>Braun</td>
<td>2000</td>
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<td>NMR AVANCE 400*</td>
<td>BRUKER</td>
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<td>GPC*</td>
<td>WATERS</td>
<td>2006</td>
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*Shared with other groups

Technical skills

- Synthesis of air sensitive metallorganic compounds
- Characterization of polymer microstructure
- Structure-physical property relationship analysis
- Synthesis of tailor-made copolymers through suitable feed composition