

COURSE “INTRODUCTION TO GREEN AND SUSTAINABLE CHEMISTRY”

February 10, 2014 (part II)

- 1) The inherence concept is frequently invoked in the development of procedures adopted for define the intrinsic safety of a process. The observation that in chemical processes it is normal (obligatory!) adopt successive protection layers (prevention and mitigation) can be considered an example of application of this concept?
- 2) Why cellulose is a source much more difficult for recovering glucose than starch? This has something to do with the fact that cellulase enzymes are found in few organisms and amylase enzymes are common to all organisms?
- 3) Miniaturization of plants has been proposed as the most valid approach in the field of process intensification of chemical plants to face the problems of a versatile production, adapted to the market and sustainable. Give examples which illustrate its potential and limits.
- 4) Which types of synthetic polymers (thermoplastic or thermosetting) are actually recycled and which biopolymers require composting as valid approach to biodegradation? In Italy the “Consorzio COREPLA” to which type of plastic material is devoted and how it operates?
- **5) RNA and DNA to which family of polymers belong? What differentiate these two natural polymers? Summarize briefly their functions.
- **6) With examples, evidence how it is possible to distinguish the transgenic technology from conventional breeding techniques. Which types of biomolecules make possible the transgenic technology?
- **7) With reference to ethanol biofuel, illustrate one of the main peculiarity of enzymes: their capacity to strongly increase metabolic reactions. Which is the other peculiarity? At which family of natural polymers belong enzymes and how they are formed?
- 8) Why chlorine is added to drinking water? Indicate alternative “a little greener” or “very greener” to chlorine for this application. Why in this case the replacement of the chlorine has been readily accepted, even not yet widespread, while it is so difficult to replace hazardous compounds in specialist applications. Give examples.
- 9) Highlight the main strategies to be taken in the direction of the design for intrinsic safety. In which sense, the reliability of systems and procedures may contribute to the risk management? Why a process can be made more safe, but it will never be completely safe?
- 10) Highlighted the potential of bio-based C5 chain unit as a source of new products.
- 11) Industrial solvents (VOC) are now included among the reactants under special chemical control in international regulations and it is believed that the REACH EU legislation will bring to ban some of them. Which are the solvents most subject to attention and which proposals can be made for their replacement?
- *12) Which are the most important principles to be adopted in the development of a fermentation process for the production of a chemical compound? The secondary metabolism can be the basis for a fermentation process. Give examples
- *13) Explain with examples the problems in practical application of the three main non-food constituents of biomasses. Why in obtaining paper from wood we use an oxidative method, while in the production of second generation bioethanol hydrolytic methods are specifically applied?
- *14) Catalyst heterogenization is a quite hunted approach in industrial processes for the production of synthetic chemical compounds that employ transition metals but it is also very important in biotechnology processes. With examples highlight how we face the problem in both cases and which limits and benefits it involves.

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