INCA
Consorzio Interuniversitario Nazionale
"La Chimica per l'Ambiente"
www.incaweb.org

Excerpt from

Research plan of the INCA Consortium

Prepared by the Scientific Board in March 2010

Macro-area I – Fundamental methods

Green Chemistry for Fine Synthesis

Green chemistry shows a strong industrial connotation, being primarily focused on the abatement of the impact of chemical products, in particular of those manufactured on a large industrial scale.

There are some niche products fabricated in small quantities at academic or industrial research laboratories which are often innovative, but sometimes lack optimization and show a proportionally higher impact. Even if the risk is low due to the limited amounts, it is necessary to assess the environmental performance of these single processes, in accordance with Green Chemistry principles, before performing their optimization prior to their production.

In the abovementioned sectors some new technologies, reagents, and reaction conditions can be applied:

- new catalysts and new catalytic conditions (immobilized catalysts, organic catalysis, etc.);
- non-conventional activation methods, such as photochemistry, use of microwaves and ultrasounds;
- non-conventional reaction conditions, new solvents, use of solvents in supercritical conditions, ionic liquids, new (micro-)reactors.

The boundary existing between pure and applied research must be traversed in order to limit pollution and the waste of resources. This can be achieved through different combined approaches, such as: recovery and reuse of catalysts, minimization of phases and reagent quantities, economic feasibility, toxicological assessment.

Besides these new findings, the importance of the environmental evaluation must be stressed. Namely, this entails the wide use of life cycle assessment (LCA), in order to: i) reveal the actual impact related to each process and to allow its direct comparison with alternative methods; ii) identify critical phases and possible corrective actions.

Such an approach shows an high added didactic value at a university level. It can be profitably used for devising explicative synthetic pathways in advanced laboratory courses for chemistry students. Conversely, the adoption of such approach in industries provides benefits in terms of education and ethics.