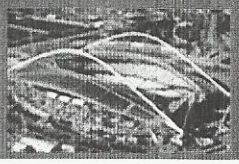
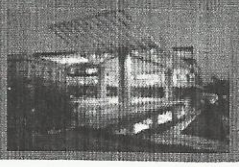
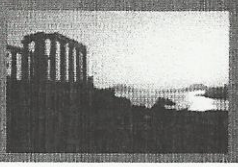
High-Energy microenvironments for selective green chemical modification of complex molecules and nanostructures

International Conference on Chemistry for Health

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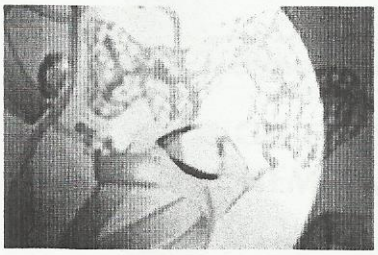
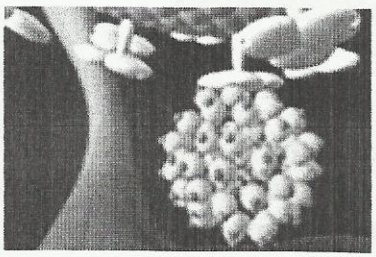
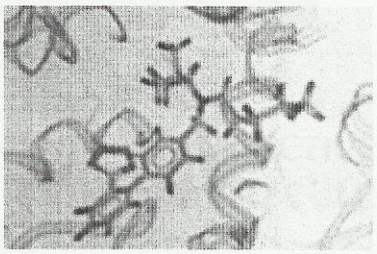

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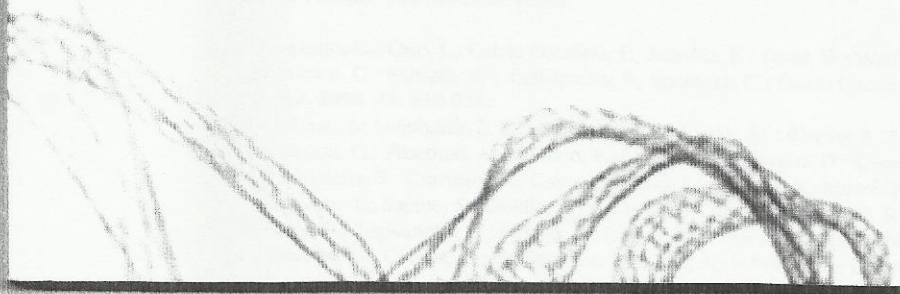

Keynote Lecture - 17

HIGH-ENERGY MICROENVIRONMENTS FOR SELECTIVE GREEN CHEMICAL MODIFICATION OF COMPLEX MOLECULES AND NANOSTRUCTURES

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Synthetic chemists are increasingly paying attention to enabling technologies with an eye to achieving the double goal of obtaining high efficiency and meeting the green criteria of energy savings and the absence of dangerous catalysts and harsh reagents[1]. A sustainable development aims to design cleaner, safer and highly selective synthetic protocols, able to minimize side reactions and by-products. The scaling up of these challenging strategies, definitively pass through flow-chemistry and process intensification[2]. We experimented several non-conventional energy sources and techniques to activate catalysts[3], to react rather inert substrates[4] and to graft carbon nanotubes[5] or materials surface[6].
Nowadays high-intensity ultrasound (US), hydrodynamic cavitation (HC), microwaves (MW), radiofrequencies (RF), ball milling, flow-micro and mesoreactors, are known as well established reliable techniques, usually applicable from lab-scale to tonn-scale. Often such enabling technologies make feasible even critical conversions of poorly reactive substrates. A comparison of processes performed under classic conditions and under non-conventional techniques is not a trivial task. Most likely, we can expect the generation of high-energy microenvironments (hot spots or others) that strongly promote reactions in spite of the same bulk temperature. The impressive effect of US and MW, alone or combined, to promoted Cucatalyzed 1,3-dipolar cycloadditions on macromolecules[7], the efficient mechanochemical Suzuki cross-couplings of aryl chlorides in the solid-state[8], and the solvent-free, MW-assisted cycloaddition of carbonyl ylides, generated from a series of oxiranes, to single-walled CNTs will be discussed. We currently envisage that enabling technologies would play a major role in the research of the next years.

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