Organic Synthesis

UNIVERSITÀ
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1240

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Research activity

Brief Description of Research Activities:

We are a synthetic organic group specializing in making molecules with stimuli-responsive properties. We assemble molecules to make nanocontainers that are responsive to stimuli such as light, pH and chemical stimuli for applications in drug delivery. We are also collaborating with Acquedotto del Fiora to design artificial cells for the detection and treatment of pollutants in water. Another area of research is the design of biomimetic catalysts with enzyme-like activity that has the potential to degrade microplastics.

Cini,
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Research activity

Our research group is working on organic synthesis. Here are some ongoing projects:

ANTIBODY DRUG CONJUGATE

FAITH aims to find new therapies for the treatment of viral infections in order to effectively cope with any future pandemics. For this purpose, we are building "molecular trains" in which an antibody developed by Toscana Life Sciences acts as a locomotive capable of transporting a wagon, consisting of an antiviral drug. The specificity of the antibody allows it to reach only the infected cells where the wagon, i.e. the drug, is released and carries out its antiviral action. We are studying what kind of hook to use to best join the tractor to the trailer, so that the drug, guided by the antibody, is released exclusively inside the infected cells so as to act as a smart bomb and kill only the diseased cells!

AntiReTub aims to develop a new approach for the treatment of forms of tuberculosis that are highly resistant to common pharmacological treatments.
The project aims to select specific antigens for antibodies already existing or to be developed for the preparation of ADCs with antituberculosis activity. The antibody will allow the selective release of the drug into the infected cells, allowing the infection to be eradicated, avoiding recrudescences and worrying resistance phenomena.

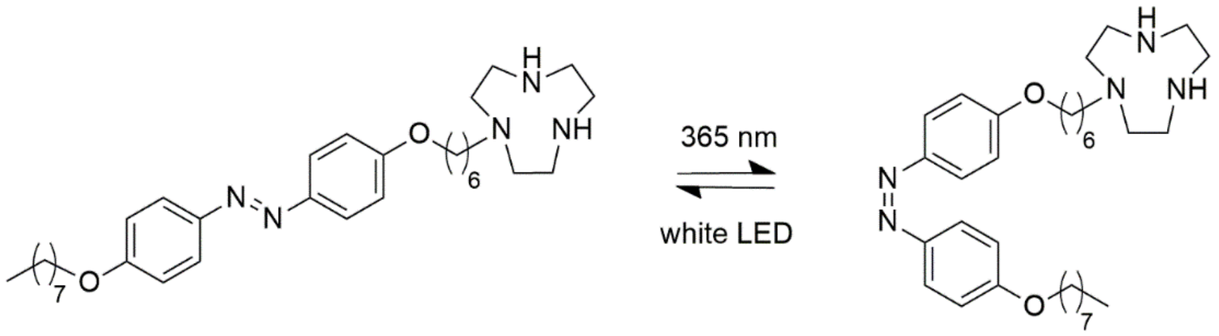
The PNRR THE and MAD projects deal with the development of ADCs for the treatment of various resistant tumors moving towards precision medicine

SUSTAINABLE PROCESSES

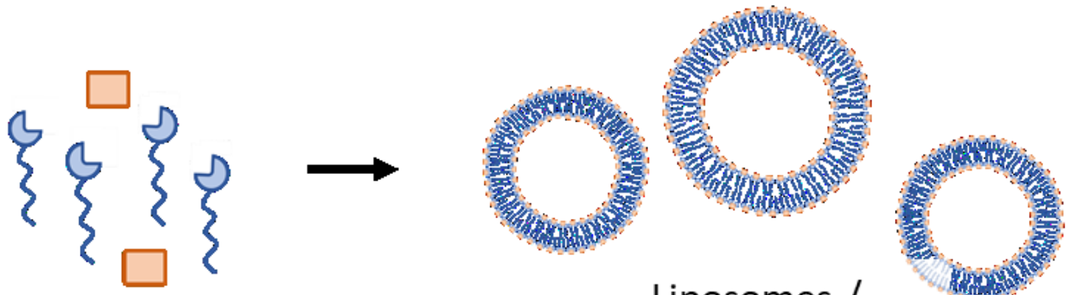
The CircularWaste project investigates the use of municipal and industrial solid waste as additives for sustainable and circular chemical reactions. In particular, the ongoing projects deal with the extraction of any active ingredients from waste biomass and the subsequent use of the residual material for the synthesis of raw materials for the industrial sector from which the waste normally comes. The idea is to exploit all the chemical information contained in the waste to obtain products with high added value.

Images

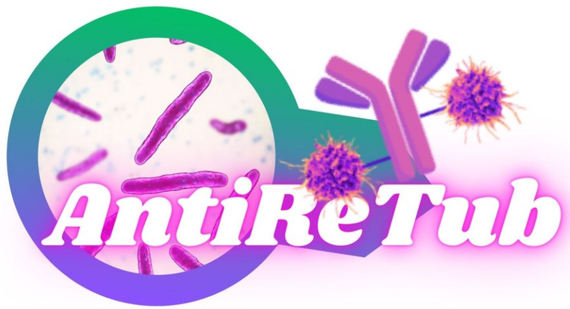
Synthesis of molecules that can change their properties upon stimulus with light, for applications in stimuli-responsive materials

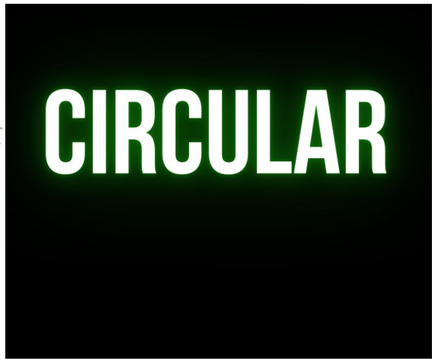


Construction of synthetic vesicles for drug-delivery applications



Liposomes /
synthetic vesicles

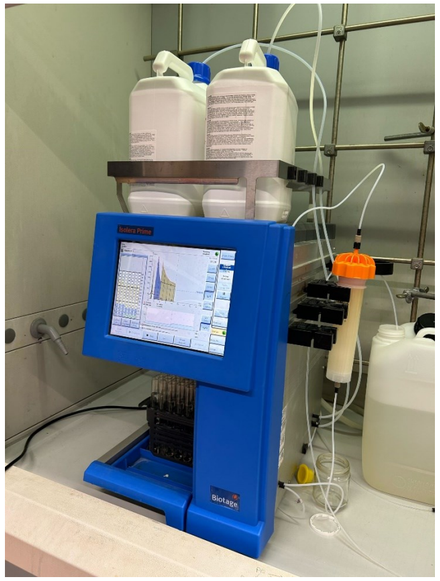




Technologies and services

Hoods and equipment for the synthesis of organic molecules, including the Schlenk apparatus for carrying out reactions under inert conditions, instruments for flash chromatography and for high-performance chromatography, also on a semi-preparative and preparative scale.

Other instruments: microwave for small molecules and petides synthesis, autoclave, NMR, GC-MS, MALDI, TOF.



Applications and collaborations

We are a synthetic organic group specializing in making molecules with stimuli-responsive properties. We assemble molecules to make nanocontainers that are responsive to stimuli such as light, pH and chemical stimuli for applications in drug delivery. We are also collaborating with Acquedotto del Fiora to design artificial cells for the detection and treatment of pollutants in water. Another area of research is the design of biomimetic catalysts with enzyme-like activity that has the potential to degrade microplastics.

We have collaborations with national (universities of Perugia, Cagliari, Pavia, Pisa, ISPRO, Fondazione Toscana Lifesciences) and international (Institut Pasteur, The Scripps Research Institute, Laval University) research groups and institutions belonging to both the academic and industrial worlds (Concerie La Bretagna).

We collaborate with other professors of the department and other universities for the analysis and evaluation of the activity of synthesized compounds and with private companies that deal with the synthesis of APIs (Chemessentia S.r.l) or products of interest in various therapeutic areas (Alfasigma S.p.A.).

The group has the skills and the right equipment to collaborate with companies that want to develop bioactive and non-bioactive molecules, starting from design to get to the synthesis of organic molecules and bioconjugates of various kinds, making the necessary analyses for their characterization and for the determination of their purity.

For more information

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