



## SUPPORT OF YOUNG RESEARCHERS – CALL B' AQUEOUS ASYMMETRIC HOMOGENEOUS CATALYSIS – YDAK

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Starting date: 01/03/2020

Duration: 16 months

Project budget: 50,050 €

Implementing Organization: National Hellenic Research Foundation, Institute of Chemical Biology

Scientist-in Charge – Academic Advisor: Dr. Ioannis D. Kostas (Research Director, NHRF)

Deputy Academic Advisor: Dr. Panayotis Kyritsis (Professor, NKUA)

Post-docs: Dr. Eleftherios Ferentinos, Dr. Polydoros-Chrysovalantis Ioannou (Young Researcher)

The object of the project "Aqueous Asymmetric Homogeneous Catalysis" (YDAK) is the improvement of innovative research in fields of transition-metal catalysis, and in particular **aqueous and asymmetric catalysis**, which retain the immense academic and industrial interest. Thus, the YDAK project proposes the development of novel ligands that contain different types of donors such as **adaptive P,N-ligands**, which offer certain advantages in homogeneous catalysis. More specifically, phosphite-phosphoramidate and aminophosphite ligands as well as pincer P,N,N-ligands will be prepared. The introduction of the chiral binaphthol moiety in the ligands should display high enantioselectivities in asymmetric transformations for the synthesis of pure enantiomeric compounds. Particular attention will be paid to the appropriate modification of the ligands to be water soluble. The coordination mode of the ligands towards transition metals (mainly Rh and Pd) will be studied. The catalytic activity and enantioselectivity of the complexes will be examined in very important reactions such as the **asymmetric hydrogenation** of unsaturated  $\alpha$ - and  $\beta$ -amino acid derivatives and dimethyl itaconate and the **asymmetric Suzuki reaction** of naphthyl halides and naphthylboronic acids towards the formation of chiral binaphthyls. The **use of water as a green solvent and the recycling of the catalyst** to achieve fully environmentally friendly processes, are very important elements of the project. The combination of both aqueous and enantioselective catalysis is very difficult, but at the same time, it is a great challenge for organic chemists. The most active catalysts will be used to synthesize specific bioactive compounds of commercial interest. The originality and innovation of the project is based on the innovative classes of compounds as catalysts with special emphasis on asymmetric catalysis, catalysis in water, recycling and reuse of catalysts. Some of the **innovative aspects of the project** are the new approaches to a combination of asymmetric and aqueous catalysis, the research

approach to new adaptive ligands for aqueous enantioselective catalysis, leading to potential commercial applications, and the study of ligands with a P–N backbone in asymmetric cross-coupling reactions. **Training of young researchers**, a possible exploitation of research results and dissemination of the results are also elements of the project. As the catalysis ensures better use of raw materials, less waste production and lower energy consumption, this project is expected to produce new data in the field of green asymmetric catalysis, which is extremely important from a scientific, environmental and socio-economic point of view, will contribute to the National scientific potential and competitiveness and will improve the excellence of the Host Organization.