

Direzione Innovazione e Internazionalizzazione

> ID VP009_CHIM

Visiting Professor Program Academic Year 2023/2024

TEACHING COMMITMENT: 16 hours

COURSE TITLE Chemistry of Aquatic Systems

TEACHING PERIOD 2nd term

SCIENTIFIC AREA Environmental Chemistry

LANGUAGE USED TO TEACH Italian, English

COURSE SUMMARY

Introduction to the treatment of water for human use. Anthropic and natural pollution of water. The chlorination technique for water disinfection, the reactions that take place in the presence of chlorine/hypochlorous acid, formation of chlorinated by-products. Water disinfection with chlorine dioxide, advantages compared to the chlorination and problems of the technique. Ozonization of water, problems linked to the use of ozone and reactions of ozone in the aqueous solution. Water disinfection by use of ultraviolet radiation. Redox reactions in natural waters, the role of oxygen. Biological oxygen activation, definition of redox potentials in natural waters. Relationship between redox potentials and biogeochemical cycles, redox speciation in thermally stratified lakes. Photochemical processes (direct and indirect photolysis) in natural waters, photochemical models to describe aquatic systems under irradiation. Speciation models for dissolved species in natural waters. General strategies to determine speciation, including acid-base reactions, complex formation and redox processes. Description of software packages able to carry out the cited

calculations. Introduction to the acid-base equilibria in natural waters: the case of carbon dioxidecarbonic acid. Distribution diagrams of the carbonate species in closed systems. Introduction to the acid-base equilibria in systems open to the atmosphere, in the presence of carbon dioxide. Solubility equilibria in open systems.

LEARNING OBJECTIVES

This course shares the general goal of providing a detailed knowledge of the systemic analysis of the natural environment. Therefore, the student will acquire competences concerning the chemical mechanisms behind the environment processes and the pollution phenomena, the dynamics of the abiotic environmental components, their interactions, as well as the environmental legislation. Moreover, the student will receive specific know-how to assess and manage the natural and anthropic changes in the ecosystems, as far as chemical processes and pollution are concerned. This knowledge will allow for the planning and management of environmental restoration practices in the framework of existing legislation and best available technologies.

TUTORSHIP ACTIVITIES

N/A

LAB ACTIVITIES

OTHER ACTIVITIES BESIDES THE COURSE N/A

VISITING PROFESSOR PROFILE

The foreseen teaching activities involve an introduction to advanced oxidation processes for water treatment and an outline of photoinduced processes that occur in natural surface waters. Coherently with the teaching activities, the visiting professor should have expertise in the field of photochemical processes taking place in the environment and/or in photoinduced processes for water treatment.

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