UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Geochimica

2223-2-E3401Q017

Aims

The course introduces the fundamental principles of Geochemistry and aims to explain the chemical mechanisms and principles underlying the main geological processes, and the interconnections with the other disciplines of Earth Sciences. Students acquire the knowledge to characterize and classify the origin of elements and isotopes, and their distribution in the main geochemical reservoirs and geospheres. The course allows you to interpret the processes of chemical and isotopic fractionation processes, and use elements and isotopic ratios as tracers of geological, hydrogeological, petrogenetic, and volcanological processes; students can reconstruct the geochemical cycles of the elements in different environments. A nod will be given to analytical methodologies in the laboratory and in the field for the study of fluid and rock samples.
The course provides basic quantitative and modeling knowledge for subsequent applications to natural and industrial processes.

Contents

Basic notions of Geochemistry. Fundamentals of nucleosynthesis and cosmochemistry. Evolution of the Earth. Geochemical affinity of the elements. Geochemical spheres. Geochemistry of the atmosphere. Geochemistry of the Hydrosphere. Geochemistry of the lithosphere. Geochemical cycles. Geochemistry of stable isotopes. Geochemistry of noble gases. Geochemistry of radiogenic isotopes. Basics of geochronology. Main methodologies and analytical techniques. Methods of visualization and processing of geochemical data. Notes on the applications of Geochemistry.

Detailed program

Presentation of the course. Basic notions of Geochemistry. Geochemical spheres. Review the elements' main

properties in relation to their position in the periodic table. The internal structure of atoms.
Fundamentals of nucleosynthesis and cosmochemistry. Evolution of the Earth.
Geochemical affinity of the elements, their influence on geochemical behaviour. Geochemical spheres.
Geochemistry of the atmosphere: genesis, evolution and chemical-physical properties, current composition.
Geochemistry of the hydrosphere, geochemistry of waters. Chemical equilibria in the aqueous phase. Partition coefficients. Weathering processes. Oxidation-reduction reactions. Eh-pH diagrams.
Geochemistry of the lithosphere. Chemical composition of the solid Earth: Core, Mantle and Crust. Element classification. Major and trace elements. Classification diagrams. Partition coefficients.
Geochemical cycles.
Geochemistry of stable isotopes (H, O, C, N, S). Delta notation, fractionation and enrichment factor. International standards. Isotopic fractionations. Evaporation and condensation process: the example of oceans and rains. Isotope composition of precipitation, world meteoric line.
Geochemistry of noble gases. Partition coefficients. Classification in the main geochemical reservoirs and geospheres.
Geochemistry of radiogenic isotopes as petrogenetic tracers.
Basics of geochronology. Mechanisms of radioactive decay, general equation of radioactive decay. Main geochronological methods.
Main methodologies and analytical techniques.
Methods of visualization and processing of geochemical data.
Notes on the applications of Geochemistry.

Prerequisites

Chemistry

Teaching form

Lectures (8 ECTS)

Textbook and teaching resource

Slides provided during the lessons

Semester

II year, II semester

Assessment method

Oral examination

Vote out of thirty

Office hours

To make an appointment, please write to the Professor: andrea.rizzo@ingv.it

Sustainable Development Goals