
BC**BIO-CLAYS INTERFACE & LIFE'S ORIGIN**

BC1**Clays & Biomolecules: From the Origin of Life to Medical Applications**

The purpose of the Session will be to provide a forum for the exchange of information among researchers of different scientific disciplines interested in understanding the nature of the association between biomolecules (notably proteins and nucleic acids) and clay minerals.

In the last few decades, scientific research has demonstrated that clay minerals, in addition to their well-known use in manufacturing, construction, curative and protective purposes, also play a leading role in some basic biological processes. In particular, studies carried out since the late 1980s have indicated that clay minerals could have represented the "primordial" site of the formation of life-critical macromolecules, triggering the molecular evolution that led to the first living cells ("life from rocks").

As information on interactions of clay minerals with biomolecules is fragmentary and scattered in the scientific literature, the session will leave the participants with a thorough understanding of the current state-of-the-art in this field.

Conveners:

Enzo Gallori - University of Florence - Florence - Italy - enzo.gallori@unifi.it

Qiaoyun Huang - Huazhong Agricultural University – Wuhan - China - qyhuang@mail.hzau.edu.cn

BC2**Clays - Living Organisms Interactions**

The content of this session will be all types of studies of interaction between clays and living organisms, whether the stress is on the study of clays or on the biological aspects. Questions that we will target are: bio-clays (clays originated by biological activity), life development/evolution and clays (relation between clays and the development, propagation and evolution of living organisms), clay-microorganism interaction, clay-macroorganism interaction, clays and exo-life (role of clay in the possible scenario of life coming from space).

Conveners:

Javier Cuadros - The Natural History Museum - London – UK - j.cuadros@nhm.ac.uk

Richard H. Worden - R.Worden@liverpool.ac.uk - University of Liverpool – Liverpool – UK

CE**CERAMICS & ENGINEERING**

CE1**Clays in Archaeological and Cultural Heritage**

The aim of the session is to create a focus on the application of Science to the study and conservation of ancient ceramics, which is a constant leitmotiv in advanced countries. Such an interdisciplinary application of Science is a fundamental tool to disclose hidden information, such as the provenance and typology of the raw materials (clays), the ancient recipes (treatment of the clays), the firing technology and the alteration pathway. The current knowledge has demonstrated the key role of clays in degradation of monuments built in clay-bricks and natural stones. A variety of pathologies on building materials can be a consequence of the interaction of clay particles with fluid transfer, moisture evaporation, saline solutions, and by a sharp change in temperature; due to these processes clay minerals can developed swelling-shrinking phenomena, aggregation-disaggregation, thermal expansions, etc. The session is undoubtedly a good opportunity to bring together geologists, chemists, engineers and possibly other people engaged in this area to discuss advances, problems, and solutions for a variety of ceramic topics.

Conveners:Bruno Fabbri – CNR - ISTECC - Faenza (RA) - Italy - fabbri@istec.cnr.itMarino Maggetti - University of Fribourg - Fribourg - Switzerland - marino.maggetti@unifr.ch

CE3**Clays in Traditional Ceramic Industry**

Ceramic products include clay bricks, wall and floor tiles, sanitaryware, tableware and other building materials. Traditional ceramic industry represent a world-wide industrial sector that moves considerable economic fluxes and involves elevated number of countries in Europe, Asia and North and South America. The key of the improvement of the sector is the R&D on the aesthetical and functional properties of end products. This session invites contributions dealing with the use of clay minerals and/or alternative raw materials for the obtainment of ceramic products with special emphasis to the following topics: innovative and improved functionalities and environmental aspects.

Conveners:Fernanda Andreola - University of Modena & Reggio Emilia – Modena - Italy - andreola.fernanda@unimore.itTiziano Manfredini – University of Modena & Reggio Emilia – Modena – Italy – tiziano.manfredini@unimo.it

CE4**Colloids & Rheology**

The particle size and size distribution (from micro to nano), as well as the particle morphology, strongly influence the performance of the solid-liquid dispersions and make the behaviour of the ceramic (clay, oxide or non-oxide based) suspensions very complex. Despite the huge amount of literature on model systems, most materials of technological relevance for many traditional and new processes are still addressed by a trial and error approach that should be replaced by a multidisciplinary contribution from engineering, chemistry and physics. Rheology is a powerful tool to characterize the materials and let to obtain very useful information about the microstructure of the colloidal suspensions. In this session papers are invited to focus on the interparticle interactions and colloid stability, the effect of inorganic deflocculant on electrostatic repulsion, the adsorption of neutral or charged polymeric additives on the solid surfaces, the rheological modelling of complex systems.

Conveners:Carmen Galassi – ISTECC - CNR – Faenza (RA) – Italy - carmen.galassi@istec.cnr.it

CE5**Desiccation and Fracture in Clay**

Clay particles, both natural and synthetic, form suspensions in different solvents. When the solvent evaporates, characteristic patterns of cracks appear on the surface of the dried clay. The patterns are usually fractal and their details depend on the solvent, the clay, the substrate, as well as external conditions - temperature, humidity and desiccation rate.

Interesting modifications of the crack patterns can be produced in several ways, such as applying an electrostatic field or subjecting the suspension to periodic motion before drying. Various aspects of this problem make a fascinating study and should help in understanding the basic principles at work in clay materials. Clays, especially synthetic nano-clays such as laponite have applications in many different consumer products, like paints, cosmetics and ointments. They are also used in petroleum industry and as coatings. So the problem of cracking and peeling of clay layers is also important from a practical point of view.

Conveners:Sujata Tarafdar - Jadavpur University - Kolkata – India - sujata@phys.jdvu.ac.in

CE6**Hetero-Modulus Ceramics for Technical Application**

Hetero-modulus ceramics (HMC) are an effective combination of a ceramic matrix with high Young's modulus (300–600 GPa) with additions of a particulate/fibrous phase with significantly lower Young's modulus (15–20 GPa) such as sp²-structured carbon or boron nitride. Subsequently it becomes more effective to use brittle refractory compounds (carbides, oxides, nitrides, borides) with the highest hardness and melting points in many technical applications, as its low thermal shock resistance can be greatly improved by the addition of low-modulus phases. Similar materials, successfully applied in rocket design, e.g. 3D-Cf/SiC, were referred to as "high-E – low-E composites" or "hetero-modulus ceramics". The experience gained through its military application is being applied to civil fields of technology, as HMC provide great opportunities. It is also known as "soft ceramics"; emphasizing its remarkable machinability by conventional tools, which is not normally attainable with ceramics.

Conveners:

Igor L. Shabalin - The University of Salford - Salford, UK - I.Shabalin@salford.ac.uk

CE7**Modified Clays & New Applications**

Recently more and more research teams have focused on the pre-treatment of clay surfaces to improve and/or change their properties for specific use (sorption, catalysis, etc.). Clays (or aluminosilicates) represent commonly used, widely available and often low-cost material with convenient characteristics (stability and homogeneity, fine structure, surface activity); moreover, they are friendly to the environment. Despite the wide use of aluminosilicates nowadays, many applications are limited due to their natural properties (surface charge, pH(ZPC), specific surface and porosity, particle size, etc.). A simple modification of clay surface (e.g. with metal ions) is of increasing concern of material studies, because it opens new possibilities in effective and economical material applications of second-rate, even waste aluminosilicates.

Conveners:

Barbora Dousova – Institute of Chemical Technology in Prague - Prague - Czech Republic - barbora.dousova@vscht.cz
Raghavan Pattathil - NIIST – CSIR - Kerala - India - pattathilraghav@rediffmail.com

CE8**Processing and Properties of Ceramic Materials**

Today's, clays are used in many high-quality ceramics that are indispensable in building materials and various products for every day uses. The discipline of clay ceramics engineering has made significant progress in colloid science, powder processing, thermal and structural transformations during sintering of a large variety of materials. The availability of clay-materials to meet increased requirements for better thermal, mechanical and chemical properties is the key to emerging technologies. Recent developments in processing, properties and applications will be discussed in this symposium. Main topics are: 1) Clays for ceramics and engineering; 2) Innovative clay applications; 3) New processing techniques; 4) Thermal and structural transformations; 5) Sintering of clay compacts; 6) Microstructure-properties correlation; 7) Performance reliability; 8) Innovation of ceramic laboratory; 9) Waste management and recycling

Conveners:

Philippe Blanchart – ENSCI – Limoges - France - philippe.blanchart@unilim.fr
Ahmed K. Aboul-Gheit - Egyptian Petroleum Research Institute - Cairo - Egypt - aboulgheit2000@hotmail.com

GG**GEOLOGY & GEOCHEMISTRY****GG1****Bentonite: Genesis, Properties and Uses**

This session intends to cover all aspects of origin, composition, and properties of bentonites. It will include their several contributions to basin studies as stratigraphic marker beds, relative and absolute dating, interaction between sedimentary and volcanic processes; sediment provenance, diagenesis (K-bentonite), paleotemperature indicator and the meaning of mineralogical changes (illite dating). Also will include all the aspects of the employment of bentonites in the function of environmental protection and its improvement.

Conveners:

Aleksandra Milutinović-Nikolić - University of Belgrade - Republic of Serbia - snikolic@nanosys.ihtm.bg.ac.yu
Daisy Barbosa Alves - PETROBRAS Research Center - Rio de Janeiro - Brazil - Daisy@petrobras.com.br

GG2**Clay Mineral Association of the Cretaceous - Paleogene and Paleocene - Eocene Boundary Events**

Marine sediments of the Cretaceous-Paleogene boundary (KPB, 65 Ma ago) and the Paleocene-Eocene Thermal Maximum (PETM, 55 Ma ago) show an abrupt transition from biogenic calcite-rich ooze to a clay-rich layer. These sediments and their clay minerals contain potentially important evidence of relatively long-term atmospheric and oceanic consequences of these two abrupt global events. It is hoped that this session will offer the scientists of the KPB/PETM the opportunity to share and discuss their findings related to the clay minerals in the marine KPB/PETM sediments with clay scientists of different disciplines attending the XIVth ICC. One of the goals of the session will be to pursue a question: Do these minerals hold clues to the abrupt KPB/PETM events? In addition, the session may facilitate the development of collaborations between the KPB/PETM scientists and clay scientists.

Conveners:

Pavle I. Premovic - University of Nis - Nis – Republic of Serbia – pavle.premovic@yahoo.com

GG3**Clay Minerals & Fluid Flow through Faults**

Faults usually change, in a complex manner, the hydrologic properties of rocks over time and space either offering conduits or barriers to fluid flow. The study of fluid flow and solute transport in fractured rocks offer great potential to answer key questions of management of groundwater, petroleum, nuclear or toxic wastes and the CO₂ geological sequestration. In addition understanding of fluid flow in active fault zones can answer key questions of earthquake physics and chemistry. The role of clays in faults is more than critical in accommodating in a plastic manner slip on faults, or supporting laminar slip along with particle reorientation and their hydration-dehydration reactions that control exerted pressure in finger-like flow paths. Studies of clays in fault zones have implications for fault mechanics.

Conveners:

Dimitris Papoulis - University of Patras - Patras - Greece - papoulis@upatras.gr

GG4**Clay Minerals & Climate Change**

Clay mineral distributions in marine and continental sedimentary sequences are considered important indicators for the description of the paleoclimatic and paleoenvironmental conditions. For this purpose, they are frequently interpreted in association with others proxies like stable isotopes, micropaleontology, grain size. The paleoclimatic interpretation is based on the correlation of clay minerals with their most important genetic processes (in particular physical or chemical weathering), that appear to be related to climatic conditions. Anyway it is well known that the clay mineral composition also depends on several other factors that are not related to climate (parent rock composition, hydrothermalism, diagenesis, reworking processes). These factors have to be considered in the interpretation of clay mineral suites, because they can mask the climatic signal.

This session welcomes contributions dealing with the use of clay minerals as a tool to infer paleoclimatic and paleoenvironmental changes and also with the correct interpretation of the occurrence of clay minerals in the sedimentary sequences.

Conveners:

Luigi Marinoni University of Pavia – Pavia - Italy – marinoni@crystal.unipv.it

GG5

Clays in Geological Processes

This session is dedicated to Clay minerals, and associated phases such as Zeolites, Oxides..., considered as effective proxies (tracers) of the geological processes through time, geodynamic events, cycles and global mass balance.

We welcome contributions, from natural case and experimental or modeling studies, about the significance of clay minerals occurrence in various geological processes and environments such as:

- chemical transfers between earth envelopes and interfaces: ocean-crust, ocean-sediments interactions, transition continent-ocean processes;
- authigenesis and early diagenetic processes (ocean, margins, lakes...);
- hydrothermalism (continental and oceanic) and HT and LT alteration processes
- serpentinisation processes;
- clays in subduction processes (dehydration, neoformation...);
- glauconite, palygorskite, mud volcanoes...;
- clays as petroleum caprocks.

Particular interest is given to integrated studies with other proxies, among others: i) clays and trace elements and REE signals; ii) clays and isotopes (stable and radiogenic) records.

Conveners:

Anne Marie Karpoff – CNRS – Strasbourg – France - amk@illite.u-strasbg.fr

Giovanni Mongelli – University of Basilicata – Potenza – Italy – mongelli@unibas.it

HE**HEALTH & ENVIRONMENT**

HE1**Asbestos Monitoring & Analytical Methods**

Monitoring, identification, and quantification of asbestos are essential aspects of dealing with these minerals. These investigations are very important to the regulatory community because special precautions must be taken when asbestos are found in some milieus and their quantity is greater than a certain amount. They are also necessary to study several health troubles in humans and animals.

Different techniques of monitoring and analysis are necessary depending on where the asbestos are spread: air, water, soils, rocks, biological materials, asbestos-containing materials and their transformation products. Besides, for asbestos use in health-based studies it is useful to apply several complementary analytical methods.

This session would 1) to present the state of the art about monitoring and techniques actually considered the most suitable for the different kinds of milieus and materials where asbestos are present; 2) to compare various investigation protocols adopted; 3) to exchange information about the advances in this topic; 4) to develop interdisciplinary collaborations.

Conveners:

Elena Belluso – University of Turin – Turin - Italy - elena.belluso@unito.it

HE2**Clays and Natural Zeolites in Medical Applications**

The session will give the opportunity to discuss the beneficial effects of cationic and anionic clays upon human health and medical application of zeolites. Their possible uses in pharmaceutical formulations are present in many subjects: from classical applications as orally and topical drugs to new trends as cancer therapy and geomedicine. The application of clays as excipients and their influence on the bioavailability of the organic active principle has to be represented. Clay-modified electrodes have received attention in the development of electrochemical sensors and biosensors. This session also could include aspects in which clays are involved to prevent the public health.

Conveners:

Carmen del Hoyo Martínez – University of Salamanca – Salamanca - Spain - hoyo@usal.es

HE3**Clays as Friendly Environmental Materials**

Materials have played an important role in, and have been the milestones of, human civilisation. The increased awareness of the social and economic cost and the health and ecological impact of environmental pollution and climate change has created demands for reducing pollutant and greenhouse gases (GHGs) emissions. Of vital importance to this would be the development and use of cost-effective environmental materials, which may be defined as the natural, modified, and manufactured matter that may 1) sense, detect and analyse pollutants and GHGs; 2) reduce the amount of pollutants and GHGs released into the environment; 3) decrease the mobility, reactivity, bioavailability, and ecotoxicity of pollutants in the environment; 4) decompose or transform pollutants to non-toxic or less toxic compounds; 5) deliver chemicals by environmentally friendly means; 6) improve the quality of built environment; 7) increase the efficiency of energy transformation, storage, and use; and 8) be derived from waste materials for beneficial use. This session would provide a good opportunity for researchers to exchange ideas, share experience, and develop collaborations on carbonaceous materials, clay minerals, mesoporous silica, and nanoparticles of metals and metal oxides.

Conveners:

Guodong Yuan - Landcare Research, Palmerston North - New Zealand - yuang@LandcareResearch.co.nz

HE4**Health Effects of the Reactivity of Airborne Minerals**

Inhalation of mineral particles has been demonstrated to be the origin on specific lung problems that include cancer. Mineralogy of the airborne particles depends on several factors with a geographical component, as lithology, vegetation or climate. Asbestos (amphibole and chrysotile) induce mesothelioma and lung cancer; quartz induce lung fibrosis. Clay minerals may represent a risk, especially in dry regions or clay industry, where a high burden of particles may make difficult the clearance on the inhaled particles. This session is focus on physico-chemical properties and reactivity of airborne mineral particles (including dissolution kinetics), interaction with organic substances, clearance mechanism, instrumental characterization of clays for health.

Conveners:

F. Javier Huertas - EEZ – CSIC – Granada - Spain - Javier.huertas@eez.csic.es
Pascal Dumortier – Erasme Hospital – Bruxelles - Belgium - pdumorti@ulb.ac.be

HE5**Moisture Transport through Clay**

For decades clays have been used as barriers to shield the environment from hazardous materials. Diffusion of water through degrading clay barriers governs the long term utility of such barriers. Degradation can occur by factors such as: cation replacement, repeated wetting and drying, or changes in clay compaction and these determine the long-term efficiency of barriers for containing nuclear waste, landfill materials and mine tailings. While it is envisaged that most discussion will focus on diffusivity measurement in reference & real clays, recent studies using QENS, NMR, or molecular dynamics can focus on water mobility in specific areas such as between clay particles or within the interlayer region. Fundamental problems in determining molecular diffusivity of water have been uncovered and will be reviewed. This session aims at providing a theoretical underpinning to isolating wastes – a problem of increasing importance to this more crowded yet more environmentally conscious world.

Conveners:

Laurie Aldridge - ANSTO and The University of South Wales – Australia - laurie.aldridge@gmail.com
Heloisa N. Bordallo - Hahn-Meitner Institut-Berlin – Germany - bordallo@hmi.de
Will Gates - Monash University and SmecTech Res. Cons. – Australia - gateswp@smectech.com.au

HE7**Speciation of trace elements in soils and sediments**

Soils and sediments, being at the interface between the geosphere, the atmosphere, the biosphere and the hydrosphere, represent the major sinks for trace elements released to the environment by natural and anthropogenic sources. Nowadays, it is well established that the toxicity of trace elements in the ecosystems depends not only on their total concentration, but more significantly on their chemical and physical form or speciation. Determining the speciation of trace elements in soils and sediments is paramount to understand their potential mobility, bioavailability and fate, as well as to properly assess health risks posed by them and to develop suitable methods to remediate contaminated sites. Within this context, this session will focus on the most recent advances in analytical methods and technologies to assess trace elements speciation in soils and sediments.

Conveners:

Isabel Gonzales – University of Seville – Spain - igonza@us.es
Roberto Terzano – University of Bari – Italy - r.terzano@agr.uniba.it

HE8**Stability of Clay Minerals in Geological Radioactive Waste Disposals**

Geochemical, mineralogical and physical properties of clay minerals are key role parameters for geological radioactive waste disposal, where clay minerals can be components of both the engineer barrier and the host rock. Under repository constraints clay minerals may undergo a number of processes as mineral transformations or dissolution/precipitation reactions that can modify the mineralogy and geochemistry of the clay barrier or the clayey host rock. Long-term stability of the bentonite barrier, alkaline plume nearby concrete components, acid fronts by oxidation reactions are some relevant processes for performance and assessment in underground waste repositories

Conveners:

Andreas Bauer - INE - Karlsruhe - Germany - bauer@ine.fzk.de
Tsutomu Sato - Hokkaido University -Saporo - Japan - tomsato@eng.hokudai.ac.jp

HE9**The Interaction of CO₂ with Clay Minerals**

There is increasing evidence that anthropogenic CO₂ emissions might affect the world climate in an adverse way. One of the possible measures to reduce CO₂ emissions is the storage of CO₂ in exploited oil and gas reservoirs and in deep saline aquifers. One major aspect of this storage technology is the sealing efficiency of the cap rocks, which are frequently rich in clay minerals. Since CO₂ will be mostly in the supercritical state at reservoir conditions, the physical interaction of CO₂ with clay mineral surfaces must be known as well as knowledge about chemical interactions between dissolved CO₂ (carbonic acid) and minerals is required.

Conveners:

Helge Stanjek - RWTH Aachen - Aachen - Germany - stanjek@iml.rwth-aachen.de
Emilio Galan – University of Seville – Seville - Spain – egalan@us.es

HE10**Interactions between Clays and Inorganic and Organic Pollutants**

The aim of this session is to provide a forum among environmental scientists to stimulate and promote discussion and exchange of information on the factors which affect the interactions of inorganic and organic pollutants with clays (phyllosilicates, crystalline and noncrystalline metal oxides, anionic clays) and organo-mineral complexes. Pollution induced by heavy metals and metalloids and organic xenobiotics particularly in soils is a serious environmental problem because, as compared with other kinds of pollution (atmosphere and water), the soil environment has a much lower ability to recover.

Trace elements and organic pollutants potentially toxic to plants and other living organisms are involved in many reactions such as solution and surface complexation, precipitation, sorption/desorption, and oxidation/reduction. These chemical and physicochemical interactions would influence the transfer of these pollutants to plants and contaminate the terrestrial food chain, thus endangering human and animal health. Natural and synthetic clays (e.g., double layered hydroxides) are also important adsorbents for removal of contaminants from polluted waters. The advances in spectroscopy to study various aspects of interactions of inorganic and organic pollutants with clay minerals are also of great importance in this session.

Conveners:

Antonio Violante – University of Napoli – Portici – Italy - violante@unina.it
Siobhan Stauton – INRA – Montpellier – France - stauton@montpellier.inra.fr

MC**MINERALOGY & CRYSTALLOGRAPHY****MC1****Clay Minerals in Extraterrestrial Environments**

There is increasing realization that clay minerals may have formed outside of the Earth environment, based on materials returned to Earth and on remote observations. In addition, experimental data are beginning to show that hydrous clay minerals can remain stable in extreme environments, often for long periods. This session will focus on the occurrence and stability of clay minerals in extraterrestrial environments, such as Mars, comets, meteorites, etc. Contributions on occurrences of clay minerals in such environments are solicited, as are papers discussing experimental studies on stability.

Conveners:

David L. Bish - Indiana University - Bloomington IN – USA - bish@indiana.edu
Ralph Milliken - Jet Propulsion Laboratory – Pasadena – USA - Ralph.Milliken@jpl.nasa.gov

MC2**Clay Synthesis**

The synthesis of clay or clay-like compounds/materials has made great contribution to clay science and technology in the field of fundamental research on clay chemistry and the formation mechanism of clay minerals, as well as having contributed a variety of new materials with an application in industry. Undoubtedly, the novel clay-based materials and composites are extensively based on novel synthesis methods and techniques. Consequently it is helpful to synthesize and produce novel clay and clay-like materials /composites for known and possible new applications.

Conveners:

Peter Ryan - Middlebury College - Middlebury – USA - pryan@middlebury.edu
Chun-Hui Zhou - Zhejiang University of Technology, Hangzhou, Zhejiang, P. R. China - clay@zjut.edu.cn

MC3**Crystal Chemistry and Structure of Clays**

Crystal chemistry, the relationship of chemical composition and atomic structure and related changes in physical properties, is fundamental in defining/classifying a phyllosilicate. This session covers crystal chemistry of phyllosilicates, with emphasis in composition-atomic arrangement relationship, their classification, and the related topic, techniques used for their characterization.

Conveners:

Stephen Guggenheim • University of Illinois at Chicago – Chicago – USA - xtal@uic.edu
Alain Meunier • University of Poitiers – Poitiers – France - alain.meunier@univ-poitiers.fr

MC4**Layered Double Hydroxides**

Layered Double Hydroxides are a sort of materials also known as “anionic clays” because of their particular structure: positively charged brucite-like layers, with intercalated anions. Their properties, preparation, characterization and applications have been recently reviewed in several books and monographs. They are interesting in fields as different as catalysis (as catalysts themselves or catalyst supports and catalyst precursors), medicine (as drug carriers), composites (as inorganic fillers), contamination (sorbents of pesticides and heavy metals), etc. XIV ICC will undoubtedly represent a common place where to meet and discuss to advance in knowledge and applications.

Conveners:

Claude Forano - Université Blaise Pascal, Aunière - France - claude.forano@univ-bpclermont.fr

MC5**Serpentines as Hot Clays**

Serpentine minerals are now recognized to intervene in cutting-edge research concerning mineralogy/crystallography, solid-state physics, astrophysics, geodynamics, geochemistry, ocean sciences and more applied fields like health problems, energy production and gas sequestration. This session will provide a forum for presenting and discussing recent results on those many-fold facets of these layer silicates, in their terrestrial and extraterrestrial occurrences. Observational, experimental as well as theoretical contributions to the field will be welcome.

Conveners:

Alain Baronnet - Paul Cézanne University - Marseilles– France - baronnet@crmcn.univ-mrs.fr
Marcello Mellini - Università di Siena - Siena - Italy - mellini@unisi.it

MC6**Simulation and Theory of Clay Minerals and Interfaces**

This session invites contributions dealing with the simulation and theory of clay minerals and related functional materials, including aqueous interlayer structure, structure and reactivity of clay edge sites, organic and biological hybrid materials, clay-polymer nanocomposites, and development of novel computational models and techniques. Joint computational-experimental contributions are highly welcome. Special emphasis is also given to the analysis of spectroscopic properties, nano-mechanics, and quantitative estimates of weak forces which occur in the self-assembly or ion-exchange processes involving clay minerals. Modelling techniques include, but are not limited to, electronic structure calculations, ab initio molecular dynamics, Monte Carlo, molecular dynamics, as well as mesoscale or field-based techniques.

Conveners:

Jeffery A. Greathouse - Sandia National Laboratories - Albuquerque, USA - jagreat@sandia.gov
Hendrik Heinz - The University of Akron - USA - hh29@uakron.edu

MC7**Structural Characterization of Lamellar Compounds**

Recently, structural characterization of layered compounds has benefited from the intrinsic evolution of the commonly used techniques (TEM, XAS, XRD, etc), and especially from improvements in quantitative methods of data analysis. Over the last few years significant progress has come also from the combination of these experimental approaches allowing for a thorough characterization of complex and/or very defective lamellar structures, including natural materials and mixed-layered materials. This session will be devoted to the recent advances of individual techniques, and to new possibilities offered by their combination. New structural interpretations and insights into the formation and evolution of such materials in natural environments are also relevant. Materials of interest include, but are not limited to, phyllosilicates –with emphasis in mixed-layering and layer stacking defects–, layered oxides, layer double hydroxides, and layered compounds in general.

Conveners:

Bruno Lanson – University of Grenoble - Grenoble - France - Bruno.Lanson@obs.ujf-grenoble.fr
Douglas McCarty - Chevron ETD, Houston, TX - USA, DMcCarty@chevron.com

MC8**Modeling diffraction effects from layered systems and nanomaterials**

Experimental methods for characterizing layered systems and nanomaterials progressed rapidly in the past three decades, but until recently our ability to understand the nature of such systems often relied on simulations based on hypothetical structural models. Recent advances in our understanding of diffraction effects from disordered materials and in analysis of size and strain effects in nanomaterials have greatly improved the quantitative structural models of such materials. In contrast to simulation-based interpretations, we now have the ability to extract information directly from diffraction data, using real and reciprocal space models, both allowing departures from the classical Bragg approach which assumes a periodic distribution of atoms. This session will include discussions of the application of such approaches to disordered layered systems and nanomaterials, concentrating on refinement of structural models and microstructure using diffraction data.

Conveners:

David L. Bish – Indiana University - USA - bish@indiana.edu

NM**NANO & POROUS MATERIALS**

NM1**Functional Hybrid Nanofilms**

Smectites are uniquely adapted to fabricate films with thicknesses in the nanometer range. This is due to their specific properties such as layered structure, isomorphous substitution, small size and swelling. If the swelling is pushed to the limit i.e. single clay sheets, the latter can be re-assembled into thin films in a layer by layer construction. Techniques include Layer-by-Layer assembly, Langmuir-Blodgett, spin coating. These thin films can be functionalized by introduction of suitable molecules. In that way nonlinear optical properties, magnetic properties and chirality have already been introduced.

These thin films allow fundamental studies of the single smectite sheets with spectroscopic techniques and with AFM. The organization of molecules adsorbed on the films or intercalated between the smectites layers in the films is also the subject of intense research. The goal is to control this molecular organization and to generate new properties by introduction of specific molecular organizations. An example is energy transfer between donor and acceptor molecules organized in single monomolecular layers in the films. With proteins hybrid protein-clay films are produced, which can be used as sensors and as biocatalysts. Film construction can be studied at the molecular and single clay layer levels by UV-VIS and FTIR spectroscopies and by AFM.

Conveners:

Robert Schoonheydt - K. University of Leuven - Leuven - Belgium - robert.schoonheydt@biw.kuleuven.be

NM2**Industrial Applications of Nanoclays**

Nanoclays in the past few years have become very useful in many industrial applications. These include the automotive, ceramics, paint, paper, medicinal, catalyst, pharmaceutical, and agricultural industries. The session will cover all the above applications and also cover up-to-date research and development activities. The clay minerals used in nanoclay applications are kaolinite, halloysite, montmorillonite, palygorskite, and sepiolite..

Conveners:

Haydn H. Murray - Indiana University - Bloomington IN – USA - murrayh@indiana.edu

NM3**Mesoporous Silica as Molecular Sieves**

Since the discovery of mesoporous silica molecular sieves, mesoporous materials have opened many new possibilities for application in the fields of catalysis, separation, and nanoscience. In recent years, fabrication of silica materials with designed structure (e.g. thin films, monoliths, hexagonal prisms, toroids, discoids, spirals, dodecahedron and hollow sphere shapes) is an important research in modern materials chemistry. Among them the fabrication of monodispersed hollow spheres with control size and shape is fastest developing area. It is generally accepted that hollow sphere with mesopores will exhibit more advantages in mass diffusion and transportation as compared with conventional hollow spheres with solid shell. They can serve as a small container for application in catalysis and control release studies.

Conveners:

Venkatathri Narayanan - Anna University - Tamil Nadu - India - venkatathrin@yahoo.com

NM4**Metal Nanoparticles Catalyzed Organic Synthesis**

Inhalation of mineral particles has been demonstrated to be the origin on specific lung problems that include cancer. Mineralogy of the airborne particles depends on several factors with a geographical component, as lithology, vegetation or climate. Asbestos (amphibole and chrysotile) induce mesothelioma and lung cancer; quartz induce lung fibrosis. Clay minerals may represent a risk, especially in dry regions or clay industry, where a high burden of particles may make difficult the clearance on the inhaled particles. This session is focus on physico-chemical properties and reactivity of airborne mineral particles (including dissolution kinetics), interaction with organic substances, clearance mechanism, instrumental characterization of clays for health.

NM5**Natural Zeolites: from Genesis to Applications**

Zeolites represent one of the most important classes of microporous rock-forming minerals, as they are common constituents in many geological environments. Extensively studied from a mineralogical point of view, they have assumed relevance for their important and unique properties (cation exchange, selective adsorption, catalysis, etc.) that find significant application in many technological sectors. They are also one of the most important indicators of low-temperature diagenetic processes and, as such, have great geological importance.

This thematic session aims to promote fruitful discussions among researchers in the geological, chemical, and materials sciences, to present the latest mineralogical and crystal-chemical results, and to communicate new information on potential applications of these fascinating materials.

Conveners:

Piergiulio Cappelletti – University of Napoli “Federico II” - Napoli, Italy - piergiulio.cappelletti@unina.it
Alessio Langella – University of Benevento Benevento – Italy - langella@unisannio.it
Nai-Qian Feng - Tsinghua University - Beijing - China - fengnq@tsinghua.edu.cn

NM6**Polymer-Clay Nanocomposites: Advantages, Properties and Uses**

The research on polymer nanocomposites by means of unique structure of clay has last for over 15 years. Lots of nanocomposites based on clay have been prepared, some industrial products have been invented and become commercial. Clay-polymer nanocomposites became the hot point in polymer research and industry and their nanometres features endows them with unique properties not shared by conventional materials and offers new technological and economic opportunities. Besides the traditional use of clays in the preparation of polymer-clay nanocomposites and as substrates in semiconductor metal pillared clays, they can be used as photocatalysts, band tuneable (ultra) thin films, liquid crystal mineral moieties, 1-D photonic materials, etc...

Conveners:

Pascua Chelo - University of the Philippines - Quezon City - Philippines - pascua.chelo@nims.go.jp
Giovanni Camino – Polytechnic of Turin – Turin - Italy - giovanni.camino@polito.it
Liqun Zhang - University of Chemical Technology - Beijing, P.R.China - zhanglq@mail.buct.edu.cn

NM7**Polymer-Clay Nanocomposites: Preparation Techniques and Theoretical Formulations**

Various ways of functionalizing or producing the clays have been used in order to make them compatible with organic polymer matrices, enhancing specific functions, mechanical, physical and chemical properties that has a high potential for various applications. These nanocomposites are prepared by various methods including sol-gel technique, solvothermal method, layer-by-layer nanoassembly, solid-state reactions, etc. to construct bulk organic/inorganic materials, nanoparticles, thin films and coatings. Significant attention is given also to biopolymers, because of their biocompatibility, biodegradability or bioactivity that offers opportunity for biomaterials fabrication.

Conveners:

Kazuko Fujii - National Institute for Materials Science - Tsukuba, Ibaraki - Japan – fujii.kazuko@nims.go.jp
Vikas Mittal - BASF SE, Ludwigshafen - Germany - vikas.mittal@chem.ethz.ch
Yury Shchipunov - Russian Academy of Sciences - Vladivostok, Russia - yas@ich.dvo.ru

NM8**Self-assembly from Clay Particles: From Nano to Macro**

Self-assembly processes and self-assembled structures are actual topics in physics and materials science. Geological clay structures were formed by self-assembly processes for which or example salt environment was one governing control parameter. In modern materials science, controlled self-assembly processes are essential for design of clay nano-composite materials, and also for smart material structures and smart material phenomena, where for example clay particles may be an ingredient.

One can in these contexts distinguish between spontaneous self-assembly (for example nematic ordering of clay platelets in gravity) and self-assembly guided by electric or magnetic fields. Essential to understand in this context is the physics of how nanostructures translate into macroscopic behaviour such as flow and elasticity of formations and of nanostructured materials in general.

Conveners:

Jon Otto Fossum - Norwegian University of Science and Technology – Trondheim - Norway - jon.fossum@ntnu.no

SS**SOILS & SEDIMENTS**

SS1**Clays and soil forming processes: an evergreen**

The purpose of this session is to explore the interface of soil science / clay mineralogy and to create an interdisciplinary platform for discussing various investigative approaches. Clay minerals are important indicators of soil mechanisms and processes. The knowledge of mineral formation and transformation and their reaction rates is fundamental to explain actual processes and to make predictions about important environmental issues. Not only knowledge about the clay phases is required, but also a detailed consideration of the environment.

To this end we welcome case and experimental studies about clay minerals formation and transformation in soils, weathering mechanisms, interaction between organic matter and mineral phases but, most especially, studies related to the influence of changed environmental conditions on the clay fraction. We hope to encourage discussions on the limitations of the methods used and the applications of the results in a more general context.

Conveners:

Eleonora Bonifacio – University of Torino - Grugliasco (TO) - Italy - eleonora.bonifacio@unito.it

Markus Egli - University of Zurich - Zurich - Switzerland - markus.egli@geo.uzh.ch

SS2**Contributions of soil mineralogy to solve agricultural, environmental, technological and other practical problems**

Clay minerals determine many soil properties. While X-ray diffraction has led many to regard clay minerals in soils as identical to those found in geological environments, the properties of one clay mineral type in two different soils can differ greatly and soil colloids often consist of complex intergrowths of different structural types. It is their surface characteristics and their associations with other soil components that often determine their role in reactions occurring in soils. This session particularly welcomes contributions on minerals that are unique to soil environments and on the link between mineral characteristics and soil properties.

The session is a joint one with Commission 2.4 (Soil Mineralogy) of the International Union of Soil Sciences

Conveners:

Jock Churchman - The University of Adelaide - Australia - jock.churchman@adelaide.edu.au

Elisabetta Barberis - University of Turin - Grugliasco (TO) - Italy - elisabetta.barberis@unito.it

UM**MISCELLANEOUS**

UM1**Teaching Clay Science**

Share your approaches and ideas on teaching and learning! Oral and poster contributions related to any aspect of teaching clay science, and demonstrations or displays used in the classroom or laboratory will be welcome. We also encourage demonstrations and displays of teaching software (on your own computer), lab manuals, or other teaching materials that you have either developed yourself, or that have been developed by others but that you and your students have found useful.

Conveners:

Darrell Schultz - Purdue University - West Lafayette - USA - dschulze@purdue.edu
Giora Rytwo - Tel Hai Academic College – Tel Hai - Israel - rytwo@telhai.ac.il

UM2**Dynamics of Fluids in Nanoporous Materials**

Porosity in solids is natural and can span wide length scales including micro-, meso- and macroporous regimes. Fluids containing inorganic and organic solutes and gaseous species can occupy the pores, grain boundaries or fractures of numerous types of complex heterogeneous solids. Porous solid matrices include rock or soil systems that contain clays and other phyllosilicates, zeolites; coal, graphite etc. and weathered or altered silicates, oxides and carbonates. A number of factors dictate how fluids migrate into and through these nano-environments and ultimately adsorb and react with the solid surfaces. These include the size, shape, distribution and interconnectedness of these confined geometries, the chemistry of the solid, the chemistry of the fluids and their physical properties. The effects of confinement have been studied extensively using variety spectroscopic and calorimetric techniques. Neutrons scattering technique has proven to be a very useful tool studying liquids in confinement.

Conveners:

.... coming soon

UM3**General Topics**

Contributions on any topic of interest to clay scientists are welcome in this session. If your planned contribution does not “fit” in a thematic session or proposed symposium, this is the place to submit it. The general session will provide a potpourri of advanced clay research that will appeal to a wide cross section of AIPEA attendees.

Conveners:

Ray Ferrell - Louisiana State University – USA – rferrell@lsu.org
