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Preface
"Layer silicate materials and clays"

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3 PREFACE4 “LAYER SILICATE MATERIALS AND CLAYS”
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8 Clay science covers an extremely wide range of basic, applicative and interconnected subject areas.
9 These subjects range from quantum-mechanical modeling of the structure of layer silicates to
10 industrial applications of clays and the origin of life on Earth, or from clay-mineral relationships to
11 terrestrial climate change, or from clay minerals to extraterrestrial environments, just to mention
12 only a few.

13 But have we arrived at all the definitive answers on clays? Have we performed all the crucial
14 observations? Have we adequately described the stability fields of clay minerals? Do we understand
15 the chemical and physical properties of clays? Can we engineer these properties and exploit them
16 for useful applications? Have we sufficiently communicated our knowledge of clays to the wider
17 scientific community and to the general public?
18

19 These and other questions were carefully examined and widely debated during the 14th
20 International Clay Conference (ICC) “*Micro et Nano - Scientiae Mare Magnum*”, which was held
21 in Castellaneta Marina (Taranto province), Italy from June 14 to 20, 2009. This conference offered
22 the scientific community an opportunity to review and update the incredible progress made in clay
23 science during last few years and to identify the many goals to be set forth for the future of clay
24 research.
25

26 The 14th ICC was organized by the Associazione Italiana per lo Studio delle Argille (AISA), on
27 behalf of the “Association Internationale pour l’Étude des Argiles – AIPEA” [1, 2].
28 Saverio Fiore, the Conference Chair, and the dynamic local organizing committee (Angelo
29 Aromando, Jessica Bellanova, Claudia Belviso, Francesco Cavalcante, Fortunato De Santis, Felice
30 Finizio, Gina Giannossi, Rocco Laviano, Antonio Lettino, Luca Medici, Donato Perniola, Piero
31 Ragone, Maria Cristi Sansone, Vito Summa, Fabio Tateo) hosted one of the largest clay
32 conferences ever, with 1028 submitted abstracts. Over 600 clay scientists from 49 countries were
33 present, with six plenary lectures, 42 keynote lectures, 24 invited presentations, and 408 oral and
34 548 poster contributions; the breadth of the conference showed the vitality of the international clay-
35 science community.
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38 The contributions were organized into eight main themes: Bio-Clays interface and life’s origin,
39 Ceramics and engineering, Geology and geochemistry, Health and environment, Mineralogy and
40 crystallography, Nano and porous materials, Soils and sediments, and Miscellanea. The themes
41 were further subdivided to produce a total of 43 sessions. The sessions covered topics such as:
42 Clays & biomolecules: from the origin of life to medical applications, Colloids & rheology, Clay
43 minerals & climate change, Stability of clay minerals in geological radioactive waste disposal,
44 Interaction of CO₂ with clay minerals, Clay minerals in extraterrestrial environments, Simulation of
45 clay mineral structures and interfaces, Polymer-clay nanocomposites, and Industrial application of
46 nanoclays. Of course, this list is not exhaustive of all the topics covered during the conference.
47 However, the list represents a general overview of the subjects and gives a flavour of the great
48 variability and intriguing aspects involved in clay science and its applications.
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53 Philosophical Magazine publishes contributed articles in the field of condensed matter describing
54 original results, theories and concepts relating to the structure and properties of crystalline
55 materials, ceramics, polymers, glasses, amorphous films, composites, and soft matter. Coverage of
56 phase transitions, nanotechnology, and novel materials is envisaged and further development is
57 expected on, for example, soft condensed matter and, in particular, the interface between hard and
58 soft matter.
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60 This Special Issue collects some selected works of “Clay Science” with the purpose to show the
wide range of applications and/or new fields, or recent relevant achievements in traditional, well-

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3 established subjects, or prospects of future developments, all related to material sciences. These
4 works were submitted to the following sessions: Bio-Clays interface and life's origin, Mineralogy
5 and crystallography, Ceramics and engineering, and Nano and porous materials.
6 In more detail, this issue includes the following contributions: Sources and Sinks of Clay Minerals
7 on Mars which was presented by R. Milliken and D. Bish [3]; Biomass and Habitability Potential
8 of Clay Minerals- and Iron-rich Environments: Testing Novel Analogs for the Mars Science
9 Laboratory Landing Sites Candidates, by R. Bonaccorsi and co-workers [4]; The Role of Clays in
10 the Prebiotic Synthesis of Sugar Derivatives from Formamide, by R. Saladino and co-workers [5];
11 Supercritical Fluid Behavior at Nanoscale Interfaces: Implications for CO₂ Sequestration in
12 Geologic Formations, by D. R. Cole and co-workers [6]; Mobility of Adsorbed Cry1Aa Insecticidal
13 Toxin from *Bacillus thuringiensis* (Bt) on Montmorillonite Measured by Fluorescence Recovery
14 After Photobleaching (FRAP), by H. Quiquampoix and co-workers [7]; Mg- and K-exchange
15 Cation Effects on the XRD Analysis of Soil Clays, by P. Aparicio and co-workers [8]; Effect of
16 Chemical Composition and Swelling on Acid Dissolution of 2:1 Clay Minerals, by P. Komadel and
17 co-workers [9]; Dielectric Properties of Micaceous Clays Determined by Terahertz Time-domain
18 Spectroscopy, by M. Janek and co-workers [10];
19 Structure and Cleavage Energy of Surfactant-Modified Clay Minerals: Influence of CEC, Head
20 Group, and Chain Length, by H. Heinz and Y. T. Fu [11]; Phase Transitions in Natural Zeolites and
21 the Importance of P(H₂O), by D. Bish and H. W. Wang [12]; An Ab initio Molecular Dynamics
22 Study of Hydronium Complexation in Na-Montmorillonite, by S. Churakov and G. Kosakowsky
23 [13]; Effects of Hydrogen Bonding on the Properties of Layered Double Hydroxides Intercalated
24 with Organic Acids: Molecular Dynamics Computer Simulations, by A. Kalinichev and co-workers
25 [14]; Clay Exfoliation in Polymer Nanocomposites: Specific Chemical Reactions and Exchange of
26 Specialty Modifications on Clay Surface, by V. Mittal [15]; Phase Transition of Conducting
27 Polymer/Clay Nanocomposite Suspensions under Electric Field, by H. J. Choi and co-workers [16];
28 Fabrication of Composites Consisting of Clay Minerals and Dyes for Nonlinear Optical Materials,
29 by J. Kawamata and co-workers [17]; Ultrathin Films of Clay-Protein Composites, by R.
30 Schooneydt and co-workers [18]; and On the High-Temperature Structural Behaviour of Talc,
31 Mg₃Si₄O₁₀(OH)₂ up to 1600° C. Effect of Mechanical Deformation and Strain, by F. Dellisanti and
32 G. Valdrè [19].
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