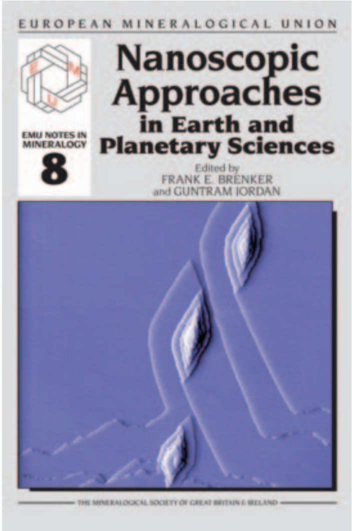
NANOSCOPIC APPROACHES IN EARTH AND PLANETARY SCIENCES[2]



Published by the European Mineralogical Union and the Mineralogical Society of Great Britain and Ireland, this volume follows the 9th EMU School entitled "Nanoscopic Approaches in Earth and Planetary Sciences," held in Munich in 2007. This seems like a long delay before publication of the book, especially since methodological developments usually go fast. However, the content of the book is clearly not outdated. Some chapters even contain bibliographic references published as recently as 2010. As noted in the preface, this book aims to provide a thorough introduction to nanoscale techniques and related results and developments in the Earth and planetary sciences. In my opinion, this goal was achieved. In a book dealing with methodological considerations, it is always difficult to find a balance between technical information and scientific applications. Some of the chapters achieve that balance perfectly, and I definitely recommend their reading to students and colleagues who need to use these techniques or process recently acquired data.

In chapter 1, Wirth gives the basics of focused ion beam (FIB) milling techniques. Considering the wealth of geoscience studies he has accomplished using FIB, he is the perfect author for this chapter. The chapter will be of great interest to those who are about to start using FIB for the preparation of ultrathin samples, getting 3-D textural and/or chemical information at the nanoscale, or performing micromachining. Indeed, in addition to providing basic facts about the instruments and ion–solid interactions, the chapter gives many practical tips that are usually difficult to find in the literature.

Chapter 2 by Brenker, about the nanopetrology of pyroxenes, shows how a TEM study of the nanostructures in pyroxenes can provide useful information on the thermal history of rocks. Chapter 3, by Golla-Schindler and van Aken, is on the use of electron energy loss spectroscopy for nanoscale determination of $Fe^{3+}/\Sigma Fe$ ratios and valence state mapping. It is definitely a must-read for everyone (and they are numerous) who wants to learn how to determine the redox state of Fe with this technique. After providing some details on the technique (scattering geometry, excitation process, shape of the ionization edges, data corrections, etc.), the authors review the different approaches that can be taken and then assess their validity and limits. These reviews read almost like simple recipes, giving you the feeling that you will be able to carry out the operations easily.

Chapter 4 by Lyon and Henkel, on time-of-flight secondary ion mass spectrometry (TOF-SIMS), and chapter 5 by Sinha and Hoppe, on ion microprobe analysis, are complementary and give a detailed overview of ion microprobe measurements. Like chapter 3, these chapters achieve a perfect balance between a detailed commentary on basic principles, ion sources, detectors, and mass analyzers on the one hand and geoscience applications on the other. These are, again in my opinion, must-read chapters.

Chapter 6, by Vincze, Silversmit, Vekemans, Terzano, and Brenker, deals with synchrotron radiation micro- and nanospectroscopy. It is restricted to hard X-ray microprobes that allow performing X-ray fluorescence (XRF) and X-ray absorption spectroscopy (XANES and EXAFS) measurements. After presenting the instrumentation, including the light source, the chapter focuses on the advantage of coupling XRF measurements with Monte Carlo simulations to achieve precise quantitative measurements of elemental concentrations at the trace level in solids. Three-dimensional micro-XRF methods as well as XANES and EXAFS spectroscopic analysis (with a short practical course on how to process EXAFS data) are also presented. One regrets the absence of a chapter on soft X-ray nanospectroscopic analysis (e.g. scanning transmission X-ray microscopy, or STXM), which allows measuring the speciation of light elements such as carbon, nitrogen, and oxygen as well as heavier elements such as the transition elements at the 25 nm scale. This technique is indeed increasingly applied in the geosciences, and it would have complemented nicely chapter 6.

In chapter 7, Pina and Jordan provide an exquisite review of the kinetics and mechanisms of growth and dissolution of mineral surfaces at the nanoscale. The chapter starts with a short section on the principles of the scanning probe microscope and in particular the atomic force microscope (AFM). Then it details applications on the growth of mineral surfaces and explains clearly what we can learn about mineral-growth mechanisms, how such growth is influenced by supersaturation, the different kinetic models, the role of defects, and the influence of organic and inorganic impurities. This is followed by a much shorter but still very interesting section on mineral dissolution.

Finally, chapter 8 by Becker, Reich, and Biswas, on nanoparticle interactions in natural systems, includes results from TEM and STM analysis. The reader interested in nanoparticles may want to read this chapter to understand how atomistic calculations, including at the quantum mechanical and empirical levels, can complement information provided by nanoscale analyses. Noteworthy, one section provides results from atomistic calculations on a calcite biomineralization template by peptides.

If you are interested in EELS, Fe redox state measurements, SIMS, synchrotron-based micro- or nano-XRF, molecular dynamics simulations, nanoparticles, AFM analyses, or mineral dissolution and growth mechanisms, you will definitely be glad to have this book on your shelves for learning and teaching purposes.

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2 Brenker FE, Jordan G (eds) (2010) Nanoscopic Approaches in Earth and Planetary Sciences. EMU Notes in Mineralogy 8. European Mineralogical Union and the Mineralogical Society of Great Britain & Ireland, 382 pp, ISBN: 978-0-903056-25-0, £40 (£25.50 for individuals)

Consequently, the 9th EMU School taking place in Munich from August 12th to 17th in 2007 was dedicated to the nanoscopic approaches in Earth and Planetary Sciences. The school was held and organized by Frank E. Brenker (Univ. Frankfurt, Germany) and Guntram Jordan (Univ. MÃ¼nchen, Germany). Additional invited lecturers were Richard Wirth (GFZ Potsdam, Germany), Ute Golla-Schindler (Univ. Earth and Planetary Sciences (miscellaneous). Publisher. Elsevier BV.Â SJR is a measure of scientific influence of journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from It measures the scientific influence of the average article in a journal, it expresses how central to the global scientific discussion an average article of the journal is. Earth and Planetary Science Letters (EPSL) is a leading journal for researchers across the entire Earth and planetary sciences community. It publishes concise, exciting, high-impact articles ("Letters") of broad interest. Its focus is on physical and chemical processes, the evolution and general properties of the Earth and planets - from their deep interiors to their atmospheres. EPSL also includes a Frontiers section, featuring invited high-profile synthesis articles by leading experts on timely topics to bring cutting-edge research to the wider community. Benefits to authors We als It was the aim of the 9th EMU school: Nanoscopic Approaches in Earth and Planetary Sciences held from 12-17th August 2007 in Munich to bring together postgraduate students with geologists, geochemists, physicists and chemists, who are experts in both developing and applying a wide range of nano-scale techniques. The lectures covered important analytical techniques ranging from atomic force microscopy, nanoscale secondary ion-beam mass spectroscopy, transmission electron microscopy, electron energy-loss spectroscopy, to the most recent development in nano-scale resolution in synchrotron radiati The department of Earth, Atmospheric and Planetary Sciences explores the the solid earth, fluid earth, the biosphere, and their interactions, as well as planetary science, solar system dynamics, and observational astronomy. (Images used with permission of: European Space Agency [background image], Tim Grove , Bob O'Connor, and Vicki McKenna [smaller images from right side, clockwise].) Featured Courses. Popular. Global Warming Science. Educator. Introduction to Geology.Â The objects and systems we study are tangible or visible to the general public and, as exemplified by climate and natural resources, are sometimes central to societal goals. The phenomena under investigation are often vexingly complex, and they engage a dEarth System Science Group, College of Life and Environmental Sciences, University of Exeter, EX4 4QE Exeter, United Kingdom; eThe Beijer Institute of Ecological Economics, The Royal Swedish Academy of Science, SE-10405 Stockholm, SwedenÂ We explore the risk that self-reinforcing feedbacks could push the Earth System toward a planetary threshold that, if crossed, could prevent stabilization of the climate at intermediate temperature rises and cause continued warming on a â€œHothouse Earthâ€ pathway even as human emissions are reduced. Crossing the threshold would lead to a much higher global average temperature than any interglacial in the past 1.2 million years and to sea levels significantly higher than at any time in the Holocene. Planetary science activities at NASA are strongly coupled to the agencyâ€™s other science programs in its Astrophysics, Heliophysics, and to a limited extent, Earth Science divisions. Each is addressed below in more detail. NASAâ€™s Astrophysics Division. The major science goals of the Astrophysics Division are to discover how the universe works, to explore how the universe began and evolved, and to search extrasolar planetary environments that might hold keys to lifeâ€™s origins or might themselves even sustain life.2 Strong scientific synergy exists between the studies of extrasolar planets and st Consequently, the 9th EMU School taking place in Munich from August 12th to 17th in 2007 was dedicated to the nanoscopic approaches in Earth and Planetary Sciences. The school was held and organized by Frank E. Brenker (Univ. Frankfurt, Germany) and Guntram Jordan (Univ. MÃ¼nchen, Germany). Additional invited lecturers were Richard Wirth (GFZ Potsdam, Germany), Ute Golla-Schindler (Univ.

Quantitative Energy-filtering Transmission Electron Microscopy in Materials Science. Published online by Cambridge University Press: 19 June 2008. Werner GroggerÂ Nanoscopic Approaches in Earth and Planetary Sciences. p. 57. CrossRef. Google Scholar. Earth Sciences Mineral structure Mineral composition Phase transitions Synchrotron radiation. This is a preview of subscription content, log in to check access. References. 1. P. Fenter, M. Rivers, N. Sturchio, S. Sutton (eds.) Applications of Synchrotron Radiation in Low-Temperature Geochemistry and Environmental Science. Rev. Mineral. Geochem. 49, MSA Series, Washington, DC (2002)Google Scholar. 2. S.R. Sutton, M.W. Caffee, M.T. Dove, ELEMENTS 2, 15â€"21 (2006)CrossRefGoogle Scholar. 3.Â L. Vincze, G. Silversmit, B. Vekemans, R. Terzano, F. Brenker, in Nanoscopic Approaches in Earth and Planetary Sciences, ed. by F. Brenker, G. Jordan. EMU Notes in Mineralogy, vol. 8 (2010), pp. 169â€"237Google Scholar. 21. Jordan, G., 2010, Nanoscopic Approaches in Earth and Planetary Sciences, The Mineralogical Society of Great Britain and Ireland. Klein, K.L., I.M. Anderson, N. De Jonge, 2011, Transmission electron microscopy with a liquid flow cell, Journal of Microscopy, Vol. 242, Pt 2, pp. 117â€"123. Laborda, F., Bolea, E., CepriÃ¡, G., GÃ³mez, M. T., JimÃ©nez, M. S., PÃ©rez-Arantegui, J., and Castillo, J. R., 2016, Detection, characterization and quantification of inorganic engineered nanomaterials: a review of techniques and methodological approaches for the analysis of complex samples: Analytica chimica acta, v. 904, p. 10-32. The department of Earth, Atmospheric and Planetary Sciences explores the the solid earth, fluid earth, the biosphere, and their interactions, as well as planetary science, solar system dynamics, and observational astronomy. (Images used with permission of: European Space Agency [background image], Tim Grove , Bob O'Connor, and Vicki McKenna [smaller images from right side, clockwise].) Featured Courses. Popular. Global Warming Science. Educator. Introduction to Geology.Â The objects and systems we study are tangible or visible to the general public and, as exemplified by climate and natural resources, are sometimes central to societal goals. The phenomena under investigation are often vexingly complex, and they engage a... Earth and Planetary Sciences (miscellaneous). Publisher. Springer Science + Business Media. H-Index. 10.Â Its main objective is a multidisciplinary approach to link scientific activities in various Earth-related fields (geophysics, geology, oceanology) with Solar System research. Our publications encompass topical monographs and selected conference proceedings, authored or edited by leading experts of international repute as well as by promising young scientists.