Materials, Technologies and Practice in Historic Heritage Structures
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Edited by

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Preface

This book aims to strengthen the knowledge base dealing with materials in historic structures, their properties, technology of use and conservation, and their performance in transforming the environment. Many of the papers in this volume were presented during the European Geosciences Union General Assembly (sessions: GMPV10 “Challenges to historical materials in urban/anthropic environments”, and ERE10 “Natural stone resources for historical monuments”) held in Vienna, Austria (2006, 2007 and 2008). In addition to these a number of invited contributions have been chosen to fill gaps in the coverage of the meetings’ original aims.

The book consists of 17 chapters dealing with inorganic construction materials used in historic structures such as adobe, stone, brick, binders, concrete and plasters. The aims of the editors were to select contributions describing various materials and not to restrict the book to one specific historic material. The idea behind this approach was that at most historic sites a great variety of materials are used; and so a variety of approaches are needed to understand the present state and future changes in the materials. The authors are leading experts from various backgrounds in the fields of architecture, civil engineering, geology, materials and conservation science. This multi-disciplinary approach allowed for the coverage of historic materials from various aspects.

The Part I of the book deals with earth as the most ubiquitous and versatile building material. One paper focuses on a UNESCO World Heritage Site in earthen architecture built by the Arabs: the Alhambra in Granada, Spain. The other two papers focus on brick; and a description is given of its manufacturing processes and properties. A case study from a World Heritage Site in Vietnam draws attention to the wide-range of uses of this historic material.

The Part II deals with natural stone. Natural stone was a particularly important construction material used for numerous locally and globally well-known monuments. The papers on this historical construction material cover a wide geographical range throughout Europe and provide examples of various techniques used in diagnostic studies.

The Part III covers binders, concrete and the combination of different techniques; it provides some of the innovative aspects of the book: the view on the evolution of the binder based materials from Roman times till the present; opus craetecicum and
the combination of this technique with brick and stone; pre-Portland cement mortars like pozzolanic and lime mortars; Roman cement; and finally early reinforced concrete.

The closing group of papers deals with the engineering approach needed to monitor and reduce the seismic hazards for historic structures and masonry buildings using innovative techniques such as that of Fibre Reinforced Polymers (FRP).

We would first like to thank the authors who participated in this publication project. Without their high quality contributions and patience during the long preparation process the book would have not been possible. The gathering of this book together could not have been done without the help of numerous colleagues who kindly agreed to review the manuscripts submitted. Their work against the clock improved the level of the papers considerably. The following persons were involved in the review process: Donato Attanasio, Luigia Binda, Karel Drozd, Gianmarco di Felice, Dionys Van Gemert, Jungner Högne, John Hughes, Nicoletta Marinoni, Laura Russo, Massimo Setti, Antonio Santos Silva, Luigi Sorrentino, Marios Soutsos, Fernando Veniale, Maureen Young, Konrad Zehnder. The review process and editorial handling were financially assisted by the institutional research project of the Ministry of Education, Youth and Sports of the Czech Republic: MSM 0021620855 “Material flow mechanisms in the upper spheres of the Earth”; and they also benefited from the support of the Hungarian Scientific Research Fund (OTKA, grant no. K63399), and the Marie Curie Reintegration Grant (European Commission, contract MERG-CT-2007-200636 with Foundation ERGOROM ’99, Bucharest). The organisation of the session GPMV10 and the work towards the publication agreement of the first editor were funded by the MEIF-CT-2005-009765 Marie Curie Intra-European Fellowship at the Istituto Universitario di Studi Superiori di Pavia, Italy (European Commission).

Finally, we would like to particularly acknowledge help from the Springer staff during production of this volume, especially publishing editor Petra van Steenbergen, whose comments and suggestions have significantly contributed to the finalization of this book. We also thank Cynthia de Jonge for her kind help.

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Diplom-Ingenieur Maria Bostenaru Dan obtained an engineering degree in architecture, with specialisation in urban planning, in 1999 from the Universität Karlsruhe (TH), Germany. She was involved, within the Collaborative Research Centre SFB (Deutsche Forschungsgemeinschaft funding) 315 “Preservation of historically relevant constructions”, in a building survey in Poland, and was employed as part time research assistant in the SFB 461 “Strong earthquakes: from geosciences to civil engineering” both at the Universität Karlsruhe. She also started as a student research on sociology of architecture, namely the participative approach, which resulted later in one of her books. She was also employed as part time research assistant on a Universität Karlsruhe internal project on marketing for the university, called Uni-Mobil and on a soil-moisture project. She did research as guest student at the State School for Arts and Design in Karlsruhe on “Spaces of Encounter” with the topic “The Rediscovered Space”. With a three year Deutsche Forschungsgemeinschaft (German Research Foundation) scholarship in frame of the Research Training Group “Natural Disasters” in Karlsruhe and a six months Marie Curie Early Stage Research Fellowship (European Commission funding) in Pavia, Italy, research was done on “Applicability and economic efficiency of seismic retrofit measures on existing buildings” and student individual studies and diploma works supervised. She was experienced researcher on the two years project “Preservation of historic reinforced concrete housing buildings across Europe” (CA’REDIVIVUS), a Marie Curie Intra-European Fellowship (European Commission funding) in Pavia. She returned to her home country, Romania, with a three year Marie Curie Reintegration Grant (European Commission funding) for research on “The innovation in the plan of the current floor: Zoning in blocks of flats for the middle class in the first half of the 20th century” (PIANO) at Foundation ERGOROM ’99. Since February 2008 she is also employed at the “Ion Minclu” University of Architecture and Urbanism, Chair for Conservation and Restoration, as researcher, a permanent position, collaborating also with the Research Centre of the University for Architectural
and Urban Studies, where she edits a book on “Urban Regeneration in the Framework of Romanian Cities Transformation. Present State and Development Trends” in a collaboration framework with the University of Genova, Italy. There she was involved in a Consiliul Național al Cercetării Științifice din Învățământul Superior (The National University Research Council, Romania) funded research on “Arts, Urban Communities, Mobilisation - The social reinsertion of the artistic and architectural project”, in putting in value the Tzigara-Samurcaș historical glass slides photographs archive, a project co-funded by the Romanian Union of Architects, and in the documentation for the edited book on research at the department. She keeps contact with earthquake engineering through a P4 of the Planul Național de Cercetare, Dezvoltare și Inovare II, Autoritatea Naționala pentru Cercetare Științifică (the Romanian 2007–2013 research framework) project lead by the University of Bucharest, the Centre for Risk Studies, Spatial and Dynamic Modelling of Earth and Coastal Systems: “Multihazard and Vulnerability in the seismic context of the city of Bucharest” (HERA) and through the voluntary project “World Housing Encyclopedia”, run by the EERI from Oakland, California, USA, and the IAEE, where she is participant since 2001. With the HERA project research she participates in the European Network COST Action TU0801 “Semantic enrichment of 3D city models for sustainable urban development” (European Science Foundation funding), as management committee member. She has been recently invited to collaborate with the University Centre for Emergency Architecture and Urbanism (“Ion Mincu” University), and since October 2009 is associated teaching staff at the Department for Urbanism, co-teaching a course on (natural and anthropic) “Risks” for Master (Bologna) in “Urban Design” with Cristina Olga Gociman, director of the Centre and course titulaire.

She has been active member of a number of professional associations, responsibilities including being member of the advisory board (Marie Curie Fellows Association, 2003), editorial board member (2003–2006) for the “World Housing Encyclopedia”, which published a summary in 2004, journal guest editor for “Natural Hazards”, “Bulletin of Earthquake Engineering”, “Natural Hazards and Earth System Sciences” and “International Journal of Architectural Heritage”, reviewer for the EuroScience Open Forum 2004, the 13th World Conference on Earthquake Engineering and the journals “Natural Hazards and Earth System Sciences”, “Building and Environment”, “Risk Analysis”, and “International Journal of Architectural Heritage”, organising and chairing conference sessions in the framework of the European Geosciences Union and the former European Geophysical Society from 2002 on. She published two books, both in German, entitled “Applicability and Economic Efficiency of Seismic Retrofit Measures on Existing Buildings” (2006) and “From the participation models of the 70s to communication forms at the end of the 20th century in architecture and urban planning” (2007), and more than 90 scientific contributions.
Richard Přikryl graduated in the field of geology of mineral deposits and geochemistry at Charles University in Prague, Czech Republic in 1992. During doctoral studies (Ph.D. thesis defended in 1998), he focused on the influence of rock fabric on the physical and mechanical properties of common building stones (granites). In 1996, after obtaining a scholarship from Swedish government, he was involved as a research fellow for a project studying effects of indentation on rock fragmentation at the Luleå University of Technology, Sweden. Since 1994, Richard Přikryl is employed at the Faculty of Science, Charles University in Prague, first as a lecturer, from 2002 as associate professor. During 2001–2005, he was commissioned to be director of the Institute of Geochemistry, Mineralogy and Mineral Resources of his home University. From 2005, he is a head of the School of Doctoral Studies of Applied Geology. Along with extensive teaching activity in the field of natural resources (Introduction to the Study of Natural Resources; Geology of Mineral Deposits; Geology and Technology of Non-Metallics; Geology of Building Raw Materials; Prospecting, Exploration and Evaluation of Natural Resources; Technical Petrography), he is deeply focused in the research of natural stone (experimental testing, provenance studies, durability evaluation, etc.). During past 15 years, he was principal investigator of 11 national and 3 international scientific research projects and of 21 contract works including applied research like mapping of the Charles Bridge masonry, evaluation of natural stone deposits suitable for the repair of historical monuments. Since 1998, he is active in the informal international network of scientists interested in the study of natural stone and its weathering processes (Stone and Atmospheric Pollution NETwork). Richard Přikryl was main organizer of 3 international conferences (2001 – Stone and Atmospheric Pollution NETwork, 2002 – Lux et Lapis, 2004 – Dimension Stone). In the frame of annual EGU (European Geosciences Union) meetings, he organized 6 sessions focused on natural stone and aggregates during 2005–2008. Based on these activities, he was main editor of 4 books published by Taylor and Francis, Geological Society London and The Karolinum Press. He co-operates and publishes with several research groups including the one headed by Prof. Ákos Török (Department of Construction Materials and Engineering Geology, Budapest University of Technology and Economics), Prof. Bernie Smith (Queen’s University Belfast) and Prof. Karel Miskovsky (Luleå University of Technology).
Ákos Török (1963) is a habilitated Associate Professor at the Budapest University of Technology and Economics and the head of Engineering Geology Division at the Department of Construction Materials and Engineering Geology. He is a graduate geologist (Eötvös Loránd University) and he also received a M.Sc. degree in environmental engineering (International Technological University, UNESCO) and a PhD degree in geology (Eötvös Loránd University). At the beginning of his career he was mostly interested in sedimentology and he was a scholar at the Geological Survey of Denmark in Copenhagen and at Postgraduate Research Institute for Sedimentology, Reading University (UK). In the early 1990s he has started to work in the field of engineering geology and rock mechanics. His main field of research includes material testing under various conditions, diagnostics of monuments, air pollution related changes in stones, weathering simulations. At the Engineering Geology Division he is currently the coordinator of engineering- and hydrogeological expert panels of major construction projects such as the new metro line in Budapest and the radioactive waste disposal site in S-Hungary.

From the late 1990s he has also started to work in conservation science and in 2005 he received a library research grant from Getty Research Institute, Los Angeles in this field. Dr. Török was a principal investigator in several international research programmes with China, Czech Republic, France, Germany, Greece, Portugal, Spain, and UK on monumental stone decay, conservation science, fire-related changes in construction materials, slope stability analyses and urban geological hazards. He has been an active committee member of COST action on “Built Heritage: Fire Loss to Historic Buildings” (C17) and he is currently a management committee member of action “Urban Habitat Constructions Under Catastrophic Events” (C26).

His teaching experience of more than 20 years involves courses at graduate, postgraduate and Ph.D. levels in various fields of geology and conservation science. As an invitee he has given courses and lectures at University of Malta, Charles University of Prague (Czech Republic), Göttingen University (Germany). Under the auspice of his supervision Ph.D. graduates have been working on slope stability, engineering geological analyses of radioactive waste disposal site, hydrogeology, stone conservation as well as laboratory and in situ testing of natural and artificial stones.

He has published more than 120 papers including book chapters and papers in referred international journals, conference proceedings and Hungarian periodicals. He is the author of the textbook Geology for Engineers (in Hungarian) and the editor of several publications. He is the president of the Hungarian National Group of the International Society for Rock Mechanics (ISRM) and also the Hungarian National Group of the International Association for Engineering Geology and the Environment (IAEG). In 2008 he was elected as a member of Permanent Scientific Committee for the organization of International Congresses on Deterioration and Conservation of Stone. At national level he is the acting president of the Engineering and Environmental Geological Section of the Hungarian Geological Society and an elected member of the Geological Committee of the Hungarian Academy of Sciences. His research activity was rewarded by Bolyai Medal of the Hungarian Academy of Sciences in 2008.
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