

From field observation to experimental petrology and back: A special issue to honour Werner Schreyer Preface

This special issue of the European Journal of Mineralogy honours the memory and life's work of Werner Schreyer (1930–2006; see Seifert & Maresch, 2007, American Mineralogist, 92, 708–710), who through his own prolific studies and considerable energy and enthusiasm aroused the interest of petrologists and mineralogists in chemical systems that are both amenable to laboratory study and applicable to nature. Werner's undergraduate and graduate education was in geology and petrology at the Universities of Erlangen and Munich. He received his doctorate at Munich (1957), and then held a post-doctoral appointment at the Geophysical Laboratory (1958–1962) before obtaining his Habilitation at the University of Kiel (1962–1966). He was appointed Full Professor of Mineralogy and Petrology at the newly founded Ruhr University in Bochum in the year 1966. Even after retiring in 1996, he remained highly active in science up until just before his death. He authored or co-authored over 250 publications, largely in international journals. A recipient of many scientific honours and awards, including a mineral named after him (schreyerite – $V_2Ti_3O_9$), he said that to him the greatest honour was the Roebling Medal, awarded by the Mineralogical Society of America in 2002. Having been trained as a geologist, Werner never lost sight of the need to make laboratory studies pertinent to interpreting minerals and rocks in the field. He had a genius for teasing out surprisingly large amounts of information from but a handful of samples, or even a single one, and then often combined his field studies with precisely planned laboratory experiments to open new avenues of research.

To pay tribute to Werner's approach, Walter Maresch, Edward Grew and Friedrich Seifert organized a special session at the 17th V.M. Goldschmidt Conference in Cologne on August 21 and 23, 2007 (see Elements, 2007, vol. 3, p. 376). The session featured 11 oral and 10 poster presentations (abstracts were published in Geochimica et Cosmochimica Acta, vol. 71, issue 15, supplement 1) by contributors from Australia, Austria, Belgium, China, England, France, Japan, Russia and the United States of America. Topics of the presentations encompassed Werner's own intellectual breadth, but with a focus on his core interests in the mineral cordierite, phase petrology in the $MgO-Al_2O_3-SiO_2-H_2O$ ("MASH") system with particular emphasis on mineral assemblages equivalent compositionally to cordierite, high- and ultrahigh-pressure minerals and assemblages, as well as borosilicate phases in the model system "MABSH". Werner and his colleagues were among the first to synthesize several compounds known only as minerals, and vice versa: Werner synthesized compounds that he suspected could form in nature and indeed natural analogues were subsequently discovered.

The papers in this comprehensive issue are written largely by contributors to the special session at the V.M. Goldschmidt Conference in Cologne, but certainly by no means limited to them. Indeed, the spontaneous response to the call for papers, together with the selfless, prompt and in-depth work of the many reviewers who have made this collection a resounding success, can be taken as a lasting and fitting tribute of many friends and colleagues to Werner Schreyer. The papers are grouped and ordered according to Werner's core interests.

Walter Maresch, Edward Grew and Friedrich Seifert
Guest Editors

Selected publications by Werner Schreyer

- Schreyer, W. & Schairer, J.F. (1961a): Compositions and structural states of anhydrous Mg-cordierites: a reinvestigation of the central part of the system $MgO-Al_2O_3-SiO_2$. *J. Petrol.*, **2**, 324–406.
—, — (1961b): Metastable solid solutions with quartz-type structures on the join $SiO_2-MgAl_2O_4$. *Z. Kristallogr.*, **116**, 60–72.
Schreyer, W. & Yoder Jr., H.S. (1964): The system Mg–cordierite– H_2O and related rocks. *N. Jb. Mineral. Abh.*, **101**, 271–342.
Schreyer, W. (1964): Synthetische und natürliche Cordierite I: Mischkristallbildung synthetischer Cordierite und ihre Gleichgewichtsbeziehungen. *N. Jb. Mineral. Abh.*, **102**, 39–67.
— (1965): Synthetische und natürliche Cordierite II: Die chemischen Zusammensetzungen natürlicher Cordierite und ihre Abhängigkeit von den PTX-Bedingungen bei der Gesteinsbildung. *N. Jb. Mineral. Abh.*, **103**, 35–79.

- (1966): Synthetische und natürliche Cordierite III: Polymorphiebeziehungen. *N. Jb. Mineral. Abh.*, **105**, 211-244.
- Schreyer, W. & Seifert, F. (1969a): Compatibility relations of the aluminum silicates in the systems $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$ and $\text{K}_2\text{O-MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$ at high pressures. *Am. J. Sci.*, **267**, 371-388.
- , — (1969b): High-pressure phases in the system $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$. *Am. J. Sci.*, Schairer Volume, **267-A**, 407-443.
- Seifert, F. & Schreyer, W. (1971): Synthesis and stability of micas in the system $\text{K}_2\text{O-MgO-SiO}_2\text{-H}_2\text{O}$ and their relations to phlogopite. *Contrib. Mineral. Petrol.*, **30**, 196-215.
- Schreyer, W. & Abraham, K. (1975): Peraluminous sapphirine as a metastable reaction product in kyanite-gedrite-talc schist from Sar Sang, Afghanistan. *Mineral. Mag.*, **40**, 171-180.
- Abraham, K. & Schreyer, W. (1976): A talc-phengite assemblage in piemontite schist from Brezovica, Serbia, Yugoslavia. *J. Petrol.*, **17**, 421-439.
- Schreyer, W. (1977): Whiteschists: their compositions and pressure-temperature regimes based on experimental, field, and petrographic evidence. *Tectonophysics*, **43**, 127-144.
- Werding, G. & Schreyer, W. (1978): Synthesis and crystal chemistry of kornorupine in the system $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3\text{-H}_2\text{O}$. *Contrib. Mineral. Petrol.*, **67**, 247-259.
- Schreyer, W., Abraham, K., Kulke, H. (1980): Natural sodium phlogopite coexisting with potassium phlogopite and sodian aluminian talc in a metamorphic evaporite sequence from Derrag, Tell Atlas, Algeria. *Contrib. Mineral. Petrol.*, **74**, 223-233.
- Schreyer, W., Horrocks, P.C., Abraham, K. (1984): High-magnesian staurolite in a sapphirine-garnet rock from the Limpopo Belt, Southern Africa. *Contrib. Mineral. Petrol.*, **86**, 200-207.
- Werding, G. & Schreyer, W. (1984): Alkali-free tourmaline in the system $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3\text{-H}_2\text{O}$. *Geochim. Cosmochim. Acta*, **48**, 1331-1344.
- Schreyer, W. (1985a): Experimental studies on cation substitutions and fluid incorporation in cordierite. *Bull. Minéral.*, **108**, 273-291.
- (1985b): Metamorphism of crustal rocks at mantle depths: high-pressure minerals and mineral assemblages in metapelites. *Fortschr. Mineral.*, **63**, 227-261.
- Massonne, H.-J. & Schreyer, W. (1987): Phengite geobarometry based on the limiting assemblage with K-feldspar, phlogopite, and quartz. *Contrib. Mineral. Petrol.*, **96**, 212-224.
- Schreyer, W., Massonne, H.-J., Chopin, C. (1987): Continental crust subducted to depths near 100 km: implications for magma and fluid genesis in collision zones. in "Magmatic Process: Physicochemical Principles", B.O. Mysen, ed. *Geochem. Soc. Sp. Publ.*, **1**, 155-163.
- Schreyer, W. (1987): Pre- or synmetamorphic metasomatism in peraluminous metamorphic rocks? in "Chemical transport in metasomatic processes", H.C. Helgeson, ed. D. Reidel Publishing Company, Dordrecht (Holland), 265-296.
- (1988): The 1987 Hallimond lecture: experimental studies on metamorphism of crustal rocks under mantle pressures. *Mineral. Mag.*, **52**, 1-26.
- Werding, G. & Schreyer, W. (1990): Synthetic dumortierite: its PTX-dependent compositional variations in the system $\text{Al}_2\text{O}_3\text{-B}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$. *Contrib. Mineral. Petrol.*, **105**, 11-24.
- Schreyer, W., Maresch, W.V., Daniels, P., Wolfsdorff, P. (1990): Potassic cordierites: characteristic minerals for high-temperature, very low-pressure environments. *Contrib. Mineral. Petrol.*, **105**, 162-172.
- Schreyer, W., Maresch, W.V., Baller, T., (1991): A new hydrous, high-pressure phase with a pumpellyite structure in the system $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$. in "Progress in metamorphic and magmatic petrology", L.L. Perchuk, ed. Cambridge University Press, 47-64.
- Schertl, H.P., Schreyer, W., Chopin, C. (1991): The pyrope-coesite rocks and their country rocks at Parigi, Dora Maira Massif, western Alps - detailed petrography, mineral chemistry and PT-path. *Contrib. Mineral. Petrol.*, **108**, 1-21.
- Tilton, G.R., Schreyer, W., Schertl, H.-P. (1991): Pb-Sr-Nd isotopic behaviour of deeply subducted crustal rocks from the Dora Maira Massif, Western Alps, Italy - what is the age of the ultrahigh-pressure metamorphism. *Contrib. Mineral. Petrol.*, **108**, 22-33.
- Werding, G. & Schreyer, W. (1992): Synthesis and stability of werdingite, a new phase in the system $\text{MgO-Al}_2\text{O}_3\text{-B}_2\text{O}_3\text{-SiO}_2$ (MABS), and another new phase in the ABS-system. *Eur. J. Mineral.*, **4**, 193-207.
- Schreyer, W. (1995): Ultradeep metamorphic rocks: the retrospective viewpoint. *J. Geophys. Res.*, **100**, B5, 8353-8366.
- Werding, G. & Schreyer, W. (1996): Experimental studies on borosilicates and selected borates. *Rev. Mineral.*, **33**, 117-163.
- Wunder, B. & Schreyer, W. (1997): Antigorite: high pressure stability in the system $\text{MgO-SiO}_2\text{-H}_2\text{O}$ (MSH). *Lithos*, **41**, 213-227.
- Schreyer, W. & Werding, G. (1997): High-pressure behaviour of selected boron minerals and the question of boron distribution between fluids and rocks. *Lithos*, **41**, 251-266.
- Schreyer, W., Pertsev, N.N., Medenbach, O., Buchard, M., Dettmar, D. (1998): Pseudosinhalite: discovery of the hydrous MgAl-borate as a new mineral in the Tayozhnoye, Siberia, skarn deposit. *Contrib. Mineral. Petrol.*, **133**, 382-388.
- Schreyer, W. (1999): High-pressure experiments and the varying depths of rock metamorphism. in "James Hutton - Present and Future", G.Y. Craig & J.H. Hull, eds. *Geol. Soc. London Spec. Publ.*, **150**, 59-74.
- Schreyer, W., Wodara, U., Marler, B., van Aaken, P.A., Seifert, F., Robert, J.-L. (2002): Synthetic tourmaline (olenite) with excess boron replacing silicon in the tetrahedral site: I. synthesis conditions, chemical and spectroscopic evidence. *Eur. J. Mineral.*, **12**, 529-541.
- Schreyer, W., Armbruster, T., Bernhardt, H.-J., Medenbach, O. (2003): Pertsevite, a new silicatian magnesioborate mineral with an end-member composition $\text{Mg}_2\text{B}_3\text{O}_3\text{F}$, in kotoite marble from east of Verkhoyansk, Sakha-Yakutia Russia. *Eur. J. Mineral.*, **15**, 1007-1018.