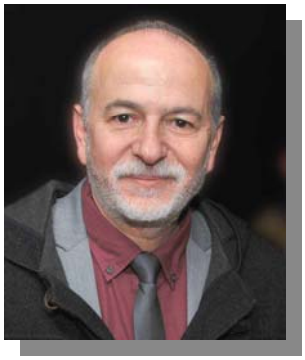
CURRICULUM VITAE

Prof. Dr. Manuel Prieto Rubio
Departamento de Geología, Universidad de Oviedo
C/ Jesús Arias de Velasco s/n, 33005 Oviedo, Spain
E-mail: mprieto@geol.uniovi.es
Telephone: 34 985103088
Fax: 34 985103103



Education:

1972-1977	Degree in Geology, Complutense University of Madrid
1978-1982	Ph.D. in Geology, Complutense University of Madrid

Positions / Service:

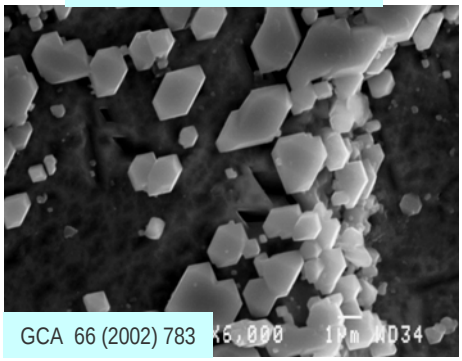
1979-1984	Teaching Assistant, Complutense University of Madrid
1984-1991	Lecturer in Crystallography and Mineralogy, Complutense University of Madrid
1985-1986	Secretary of the Faculty of Geology, Complutense University of Madrid
1991-present	Professor of Crystallography and Mineralogy, University of Oviedo
1997-2000	Dean of the Faculty of Geology, University of Oviedo
2000-2003	Coordinator for Earth Sciences of the National Agency of Evaluation and Prospective (ANEP, Ministry of Science and Technology, Spain)
2001-2003	Coordinator of the Earth Sciences Panel of the "Ramón y Cajal" Programme (Ministry of Science and Technology, Spain)
2006	Member of the Earth Science Panel of the National Research Programme (Ministry of Education and Science, Spain)
2006	Co-Editor (with U. Becker) of Chemical Geology, special issue on "Solid Solutions: from Theory to Experiment"
1994-2006	Member of the IMA Commission on "Mineral Growth and Interface processes"
2006-2010	President of the Spanish Mineralogical Society
2008-present	Member of the Experimental Sciences Panel of the Basque Country Evaluation Agency (UNIBASQ)
2010	Co-Editor (with H, Stoll) EMU Notes in Mineralogy 10, "Ion Partitioning in ambient-temperature aqueous systems"
2008- 2010	Member of the Executive Committee of Elements Magazine
2012-2014	Chief Co-Editor of the European Journal of Mineralogy
2014-present	Correspondent Member of the Royal Academy of Science (Spain)

Research Interests:

My main scientific interest is applying crystal growth concepts and techniques to the study of environmental and geochemical issues. My expertise covers thermodynamics and kinetics of ambient-temperature geochemical processes, crystal growth, and crystallography. My active research fields are:

- Crystal growth and dissolution of minerals
- Mass-transfer and crystallization in porous media
- Geochemistry of ambient-temperature solutions

Oriented overgrowth of $Ba(CrO_4,SO_4)$ crystals on barite



GCA 66 (2002) 783

- Solid solution – aqueous solution systems
- Sorption of dissolved metals on mineral surfaces
- Nucleation and metastability

Projects / Supervision (Current Research Projects in blue):

Researcher in charge for 10 projects of the National Plan of Research and Development (Spain).

Researcher in charge for the Spanish partner of the Virtual Institutes:

- Advanced Solid-Aqueous Radiochemistry (Helmholtz-Gemeinschaft, Project: VH-VI-313). 2008-2011.
- Basic research on Immobilization of long-lived Radionuclides by interaction with relevant secondary repository-phase (ImmoRad: German Federal Ministry for Education and Research, Project: 02 NUK 019A). 2012-2015. http://www.immorad.eu/index.php

Researcher in charge for the Spanish partner of the European TMR-Networks:

- Quantitying Dissolution and Precipitation of Solid-Solutions in Natural and Industrial Processes (QDPSS: European Commission, Project: HPRN-00-0058). 2000-2004.
- Mineral-Fluid Interface Reactivity (MIR: European Commission, Project: MEST-021120-2). 2006-2009.
- Mineral Nucleation and Growth Kinetics (MIN-GRO: European Commission, Project: MRTN-CT-2006-035488). 2007-2010.
- Geologic Carbon Storage (CO_2-REACT: European Commission, Project: FP7-PEOPLE-2012-ITN-317235). 2013-2016. http://www.see.leeds.ac.uk/co2react/

Network meeting (Almeria, Spain)

Supervisor of 10 Ph.D. theses and 17 Master theses on subjects pertaining to crystal growth and experimental aqueous geochemistry.

Publications:

Over 100 research papers, over 120 abstracts and proceedings, 10 book chapters, and 1 patent. Editor of two books and guest editor for two special issues of scientific journals. (Over 1750 citations; H-Index = 25 Web of Science).

Peer-reviewed international publications:

T. Roncal-Herrero, J.M. Astilleros, P. Bots, J.D. Rodríguez-Blanco, M. Prieto, L.G. Benning and L. Fernández-Díaz (2017) Reaction pathways and textural aspects of the replacement of anhydrite by calcite at 25 °C. AMERICAN MINERALOGIST 102, 1270–1278.

J. González-López, Á. Fernández-González, A. Jiménez, A. Godelitsas, S. Ladas, G. Provatas, A. Lagogiannis, I.N. Pasias, N.S. Thomaidis and M. Prieto (2017) Dissolution and sorption processes on the surface of calcite in the presence of high Co^{2+} concentration. MINERALS 7, 23; doi:10.3390/min7020023.

F. Lorenzo, A. Burgos, E. Ruiz-Agudo, C.V. Putnis & M. Prieto (2016) Effect of ferrous iron on the nucleation and growth of $CaCO_3$ in slightly basic aqueous solutions. CRYSTENGCOMM. 19, 447-460.

M. Prieto, F. Heberling, R.M. Rodríguez-Galán & F. Brandt (2016) Crystallization behavior of solid solutions from aqueous solutions: An environmental perspective. PROGRESS IN CRYSTAL GROWTH AND CHARACTERIZATION OF MATERIALS 62, 29-68.

A. Jimenez & M. Prieto (2015) Thermal stability of ettringite exposed to atmosphere: Implications for the uptake of harmful ions by cement. ENVIRONMENTAL SCIENCE AND TECHNOLOGY 49, 7957-7964.

M. Prieto (2014) Nucleation and supersaturation in porous media (revisited). MINERALOGICAL MAGAZINE 78, 1437-1447.

F. Di Lorenzo, R. M. Rodríguez-Galán & M. Prieto (2014) Kinetics of the solvent-mediated trasformation of hydromagnesite into magnesite at different temperatures. MINERALOGICAL MAGAZINE 78, 1363-1372.

M. Gonçalves & M. Prieto (2014) Non-equilibrium partitioning and compositional patterns during the growth of solid solutions from aqueous solutions: A cellular automaton simulation. CRYSTAL GROWTH & DESIGN 14, 2782-2793.

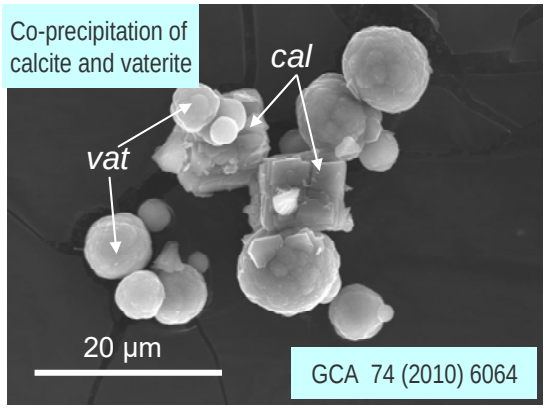
M.Prieto, J.M. Astilleros & L. Fernández-Díaz (2013) Environmental remediation by crystallization of solid solutions. ELEMENTS 9, 195-201.

A. Fernández-González, J. Carneiro, D. Katsikopoulos & M. Prieto (2013) Thermodynamic properties of the $(Ba,Pb)SO_4$ solid solution under ambient conditions: implications for the behavior of Pb and Ra in the environment. GEOCHIMICA ET COSMOCHIMICA ACTA 105, 31-43.

H.M. Stoll, W. Mueller & M. Prieto (2012) A model for interpretation of Mg/Ca, Sr/Ca and Ba/Ca variations in speleothems and its forward and inverse application on seasonal to millennial scales. GEOCHEMISTRY GEOPHYSICS GEOSYSTEMS 13, Q09004, doi: 10.1029/2012GC004183.

A. Pinto, J. Carneiro, D. Katsikopoulos, A. Jiménez & M. Prieto (2012) The link between brushite and gypsum: Miscibility, dehydration and crystallochemical behavior in the $CaHPO_4{\cdot}2H_2O$-$CaSO_4{\cdot}2H_2O$ system. CRYSTAL GROWTH & DESIGN, 12, 445-455.

A.J. Pinto, E. Ruiz-Agudo, C.V. Putnis, A. Putnis, A. Jiménez, and M. Prieto (2010) AFM study of the epitaxial growth of brushite ($CaHPO_4{\cdot}2H_2O$) on gypsum cleavage surfaces. AMERICAN MINERALOGIST, 95, 1747-1757.



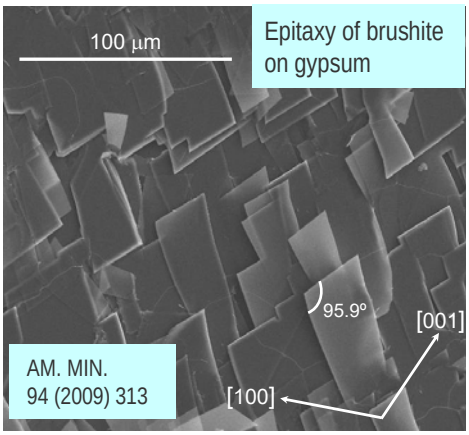
M. Prieto (2010) Thermodynamics of ion partitioning in solid solution – aqueous solution systems. In *Ion partitioning in ambient temperature systems* (eds. M. Prieto and H. Stoll). EMU-NOTES IN MINERALOGY, 10, 1- 42.

L. Fernández-Díaz, A. Fernández González, and M. Prieto (2010) The role of sulfate groups in controlling $CaCO_3$ polymorphism. GEOCHIMICA ET COSMOCHIMICA ACTA, 74, 6064-6076.

J.M. Astilleros, A. Godelitsas, J.D: Rodríguez-Blanco, L. Fernández-Díaz, M. Prieto, A. Lagoyannis, and S. Harissipoulos (2010) Interactions of gypsum with lead in aqueous solutions. APPLIED GEOCHEMISTRY 25, 1008-1016.

M. Kowacz, M. Prieto, and A. Putnis (2010) Kinetics of crystal nucleation in ionic solutions: electrostatics and hydration. GEOCHIMICA ET COSMOCHIMICA ACTA, 74, 469-481.

C. Pérez-Garrido, J.M. Astilleros, L. Fernández-Díaz, and M. Prieto (2009) In situ AFM study of the interaction between calcite {$10\bar{1}4$} surfaces and supersaturated Mn^{2+} – CO_3^{2-} aqueous solutions. JOURNAL OF CRYSTAL GROWTH 311, 4730-4739.



Epitaxy of brushite on gypsum

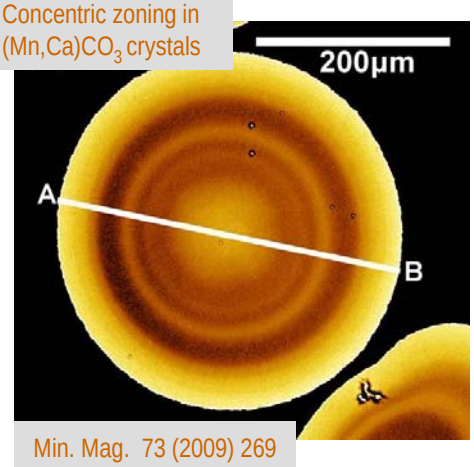
D. Katsikopoulos, Á. Fernández-González, and M. Prieto (2009) Crystallization behaviour of the $(Mn,Ca)CO_3$ solid solution in silica gel: nucleation, growth and zoning phenomena. MINERALOGICAL MAGAZINE 73, 269-284.

D. Katsikopoulos, Á. Fernández-González, and M. Prieto (2009) Precipitation and mixing properties of the ‘‘disordered” (Mn,Ca)CO3 solid solution. GEOCHIMICA ET COSMOCHIMICA ACTA 73, 6147-6161.

M. Prieto (2009) Thermodynamics of solid solution-aqueous solution systems. In *Thermodynamics and Kinetics of Water-Rock Interaction* (eds. E. H Oelkers and J. Schott) REVIEWS IN MINERALOGY AND GEOCHEMISTRY 70, 47-85.

A. Pinto, A. Jiménez, M. Prieto (2009) Interaction of phosphate-bearing solutions with gypsum: epitaxy and induced twinning of brushite ($CaHPO_4{\cdot}2H_2O$) on the gypsum cleavage surface. AMERICAN MINERALOGIST 94, 313-322.

Concentric zoning in $(Mn,Ca)CO_3$ crystals



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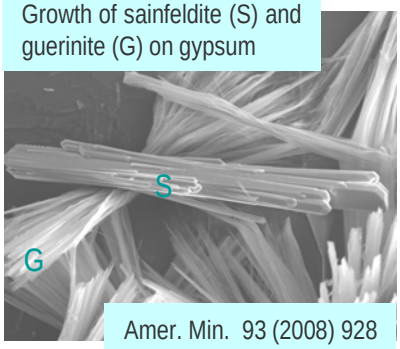
A. Pinto, A. Jiménez, M. Prieto (2008) Dehydration behaviour of $Ca(SO_4, HPO_4).2H_2O$ solid solutions. MINERALOGICAL MAGAZINE 72, 277-281.

D. Katsikopoulos, A. Fernández-González, and M. Prieto (2008) Crystallization of the $(Cd,Ca)CO_3$ solid solution in double diffusion systems: the partitioning behaviour of Cd^{2+} in calcite at different supersaturation rates. MINERALOGICAL MAGAZINE 72, 433-436.

D. Katsikopoulos, A. Fernández-González, A.C. Prieto, and M. Prieto (2008) Co-crystallization of Co(ii) with calcite: implications for the mobility of cobalt in aqueous environments. CHEMICAL GEOLOGY 254, 87-100.

A. Fernández-González, V.B. Pedreira, M. Prieto (2008) Crystallization of Zoned $(Ba,Pb)SO_4$ single crystals from aqueous solutions in silica gel. JOURNAL OF CRYSTAL GROWTH 310, 4616-4622.

Growth of sainfeldite (S) and guerinite (G) on gypsum



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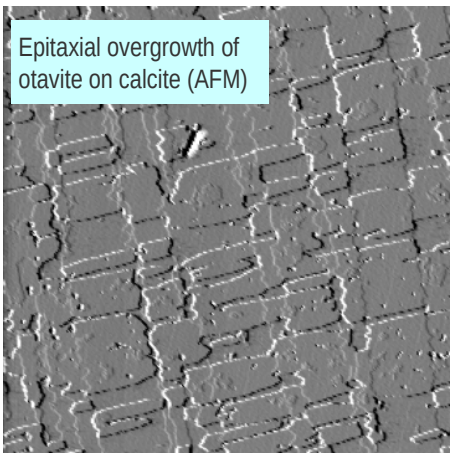
J. Carneiro, H. Stoll, and M. Prieto (2008) Uptake of Cd from seawater by calcite. MINERALOGICAL MAGAZINE 72, 389-392.

J. D. Rodríguez-Blanco, A. Jiménez, M. Prieto, L. Torre, and S. García-Granda (2008) Interaction of gypsu m with As(V)-bearing aqueous solutions: surface precipitation of guerinite, sainfeldite, and $NaCa_2H(AsO_4)_2{\cdot}6H_2O$, a synthetic arsenate. AMERICAN MINERALOGIST 93, 928-939.

C. Pérez-Garrido, L. Fernández-Díaz, C.M. Pina, and M. Prieto (2007) In situ AFM observations of the interaction between calcite (10-14) surfaces and Cd-bearing aqueous solutions. SURFACE SCIENCE 601, 5499-5509.



Epitaxial overgrowth of otavite on calcite (AFM)

J. D. Rodríguez-Blanco, A. Jiménez, and M. Prieto (2007) Oriented overgrowth of pharmacolite ($CaHAsO_4 \cdot 2H_2O$) on gypsum ($CaSO_4 \cdot 2H_2O$). CRYSTAL GROWTH AND DESIGN 7, 2756-2763.

M. Prieto, J.M. Astilleros, C.M. Pina, L. Fernández-Díaz, A. Putnis (2007) Comment: Supersaturation in binary solid solution-aqueous solution systems. AMERICAN JOURNAL OF SCIENCE 307, 1034-1045.

Fernández-González, A. Andara, and M. Prieto (2007) Mixing Properties and Crystallization Behaviour of the Scheelite-Powellite Solid Solution. CRYSTAL GROWTH AND DESIGN 7, 542-552.

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S. Köhler, P. Cubillas, J. D. Rodríguez-Blanco, C. Bauer , and M. Prieto (2007) Removal of cadmium from wastewaters by aragonite shells and the influence of other divalent cations. ENVIRONMENTAL SCIENCE AND TECHNOLOGY 41, 112-118.

Jiménez, J.D. Rodríguez, L. Torre-Fernández, M. Prieto, and S. García-Granda (2006) Crystal Structure of dicalcium sodium monohydrogen diarsenate hexahydrate, $Ca_2Na[HAsO_4][AsO_4] \cdot 6H_2O$. ZEITSCHRIFT FÜR KRISTALLOGRAPHIE – NEW CRYSTAL STRUCTURES 221, 241-242.

Fernández-González, A. Andara, J. M. Alía, and M. Prieto (2006) Miscibility in the $CaSO_4 \cdot 2H_2O$–$CaSeO_4 \cdot 2H_2O$ system: Implications for the crystallisation and dehydration behaviour. CHEMICAL GEOLOGY 225, 256-265.

J.M. Astilleros, C.M. Pina, L. Fernández-Díaz, M. Prieto, A. Putnis (2006) Nanoscale phenomena during the growth of solid solutions on calcite {10-14} surfaces. CHEMICAL GEOLOGY 225, 322- 335.

U. Becker and M. Prieto (2006) Solid solutions: from theory to experiment CHEMICAL GEOLOGY 225, 173-175.

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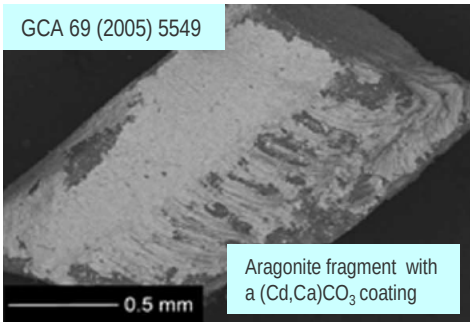
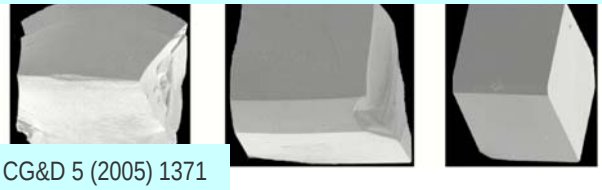


Aragonite fragment with a $(Cd,Ca)CO_3$ coating

P. Cubillas, S. Köhler, M. Prieto, C. Causserand, E.H. Oelkers (2005) How do mineral coatings affect dissolution rates? An experimental study of coupled $CaCO_3$ dissolution–$CdCO_3$ precipitation GEOCHIMICA ET COSMOCHIMICA ACTA 69, 5459-5476.

Morphology of $Ba(SeO_4,SO_4)$ crystals as a function of composition



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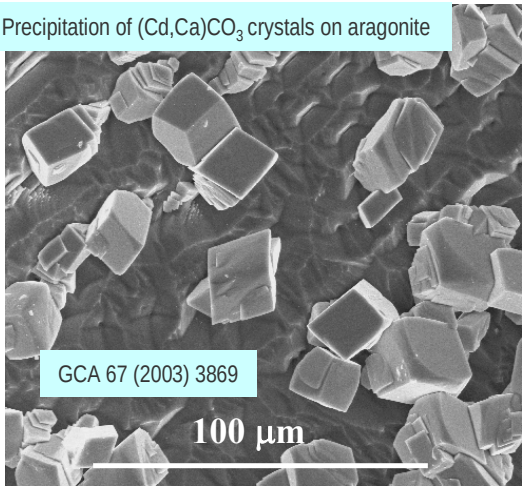
Andara, M.A. Salvadó, A. Fernández-González, S. García-Granda, M. Prieto (2005) Crystal structure of barium selenate, $BaSeO_4$. ZEITSCHRIFT FÜR KRISTALLOGRAPHIE – NEW CRYSTAL STRUCTURES 220, 5-6.

Andara, D. Heasman, A. Fernández-González & M. Prieto (2005) Characterisation and crystallisation of the $Ba(SeO_4,SO_4)$ solid solution. CRYSTAL GROWTH AND DESIGN 5, 1371-1378.

P. Cubillas, S. Köhler, M. Prieto, C. Chaïrat, and E.H. Oelkers (2005) Experimental determination of the dissolution rates of calcite, aragonite and bivalves. CHEMICAL GEOLOGY 216, 59-77.

P. Cubillas, M. Prieto, S. Köhler, E.H. Oelkers (2004) Coupled dissolution/precipitation rates in the system $CaCO_3$-$CdCO_3$. WATER-ROCK INTERACTION 11 (USGS), 741-744.

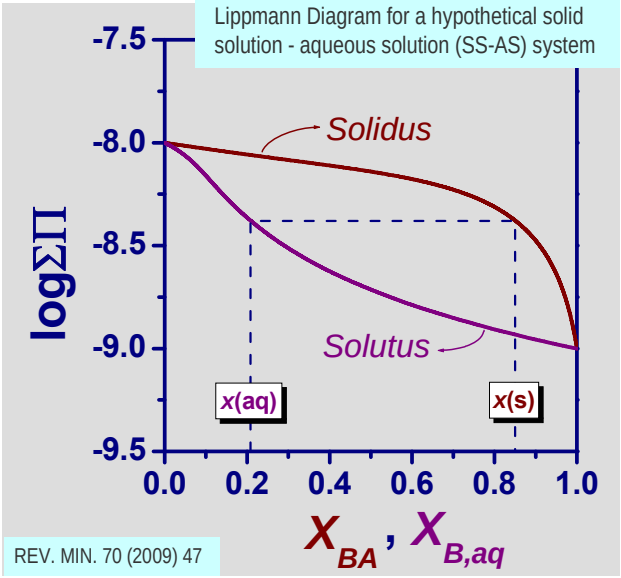
Precipitation of $(Cd,Ca)CO_3$ crystals on aragonite



Jiménez, M. Prieto, M.A. Salvadó, and S. García-Granda (2004) Structure and crystallization behavior of the $(Ba,Sr)HAsO_4 \cdot H_2O$ solid-solution in aqueous environments. AMERICAN MINERALOGIST 89, 601-609.

M. Prieto, P. Cubillas, and A. Fernández-González (2003) Uptake of dissolved cadmium by biogenic and abiogenic aragonite: a comparison with sorption onto calcite. GEOCHIMICA ET COSMOCHIMICA ACTA 67, 3859-3869.

Lippmann Diagram for a hypothetical solid solution - aqueous solution (SS-AS) system



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A. Putnis, C. Pina, J.M. Astilleros, L. Fernández-Díaz & M. Prieto (2003) New developments in Mineral surface Sciences. JOURNAL OF MINERALOGICAL AND PETROLOGICAL SCIENCES 98, 9-18.

A. Putnis, C. Pina, J.M. Astilleros, L. Fernández-Díaz & M. Prieto (2003) Nucleation of solid solutions crystallizing form aqueous solutions. PHILOSOPHICAL TRANSATIONS OF THE ROYAL SOCIETY OF LONDON A 361, 615-632.

M. Prieto, A. Fernández-González, and R. Martín-Díaz (2002) Sorption of chromate ions diffusing through barite-hydrogel composites: Implications for the fate and transport of chromium in the environment. GEOCHIMICA ET COSMOCHIMICA ACTA 66, 783-795.

C. Pina, L. Fernández-Díaz, M. Prieto, and S. Veintemillas-Verdaguer (2001) Metastability in drowning-out crystallisation: precipitation of highly soluble sulphates. JOURNAL OF CRYSTAL GROWTH 222, 317-327.

M. Prieto, L. Fernández González, U. Becker, A. Putnis (2000) Computing Lippmann diagrams from direct calculation of mixing properties of solid solutions. AQUATIC GEOCHEMISTRY 6, 133-146.

U. Becker, A. Fernández-González, M. Prieto, R. Harrison, and A. Putnis (2000) Direct calculation of the thermodynamic properties of the barite-celestite solid solution from molecular principles. PHYSICS AND CHEMISTRY OF MINERALS 27, 291-300.

C.M. Pina, L. Fernández-Díaz, M. Prieto, A. Putnis (2000) In situ AFM observations of the phosgenite-cerussite transformation. GEOCHIMICA ET COSMOCHIMICA ACTA 64, 215-221.

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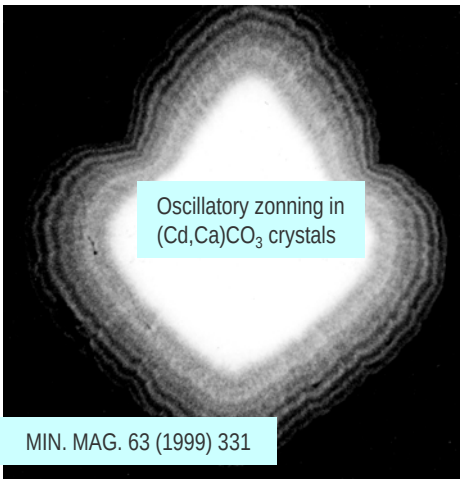
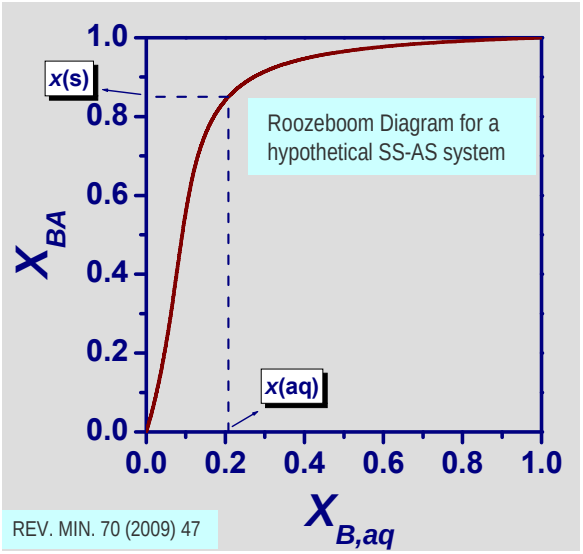
Fernández-González, M. Prieto, A. Putnis, and S. López Andrés (1999) Concentric zoning patterns in crystallizing $(Cd,Ca)CO_3$ solid-solutions from aqueous solutions. MINERALOGICAL MAGAZINE 63, 331-343.

J.M. Alía, H.G.M. Edwards, A. Fernández, F.J. García-Navarro, M. Prieto (1999) FT-Raman spectra of cis-bis (thiourea) selenium (II) chloride and bromide. JOURNAL OF MOLECULAR STRUCTURE 510, 107-112.



J.M. Alía, H.G.M. Edwards, A. Fernández-González, M. Prieto (1999) FT-Raman spectroscopic study of $Ba(SO_4)_x(CrO_4)_{1-x}$ solid solution. JOURNAL OF RAMAN SPECTROSCOPY 30, 105-114.

C. Marcos, J.M. Alía, V. Adovasio, M. Prieto, S. García-Granda (1998) Bis (thiourea) cadmium Halides. ACTA CRYSTALLOGRAPHICA C 54, 1225-1229.



C.M. Pina, D. Bosbach, M. Prieto, A. Putnis (1998) Microtopography of the barite (001) face during growth: AFM observations and PBC theory. JOURNAL OF CRYSTAL GROWTH 187, 119-125. Citations: 28.

C.M. Pina, L. Fernández-Díaz & M. Prieto (1997) Crystallization of β-$LiNH_4SO_4$ and $(NH_4)_2SO_4$ in gels: growth morphology and epitaxy phenomena. JOURNAL OF CRYSTAL GROWTH 177, 102-110.

M. Prieto, A. Fernández-González, A. Putnis, L. Fernández-Díaz (1997) Nucleation, growth, and zoning phenomena in crystallizing $(Ba,Sr)CO_3$, Ba (SO_4, CrO_4) $(Ba,Sr)SO_4$, and $(Cd,Ca)CO_3$ solid solutions from aqueous solutions. GEOCHIMICA ET COSMOCHIMICA ACTA 61, 3383-3397.

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L. Fernández-González, A. Putnis, M. Prieto & C.V. Putnis (1996) The role of magnesium in the crystallization of calcite and aragonite in a porous medium. JOURNAL OF SEDIMENTARY RESEARCH 66, 482-491.

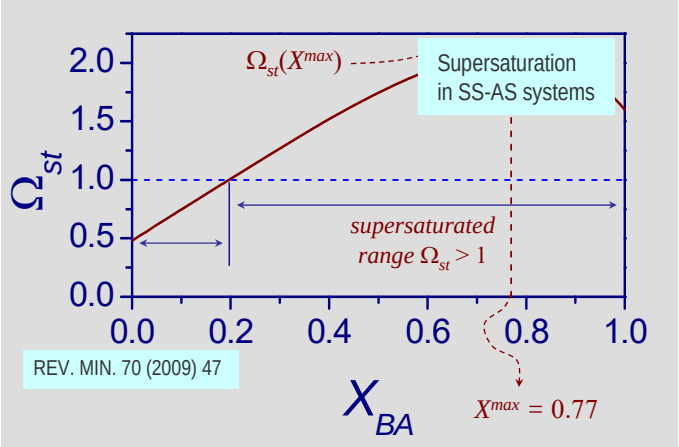
M. Prieto, A. Paniagua, and C. Marcos (1996) Formation of primary fluid inclusions under influence of the hydrodynamic environment. EUROPEAN JOURNAL OF MINERALOGY 8, 987-996.

Pina, L. Fernández-Díaz, and M. Prieto (1995) Topotaxy relationships in the transformation phosgenite-cerussite. JOURNAL OF CRYSTAL GROWTH 158, 340-345.

S. López-Andrés, M.J. Suarez, and M. Prieto (1995) Epitaxial overgrowth of $LiKSO_4$ on β-K_2SO_4 single crystals. CRYSTAL RESEARCH AND TECHNOLOGY 30, 775-783.

Putnis, M. Prieto, and L. Fernández-Díaz (1995) Fluid supersaturation and crystallization in porous media. GEOLOGICAL MAGAZINE 132, 1-13.

M. Pina, L. Fernández-Díaz, J. López-García, and M. Prieto (1995) Growth of β–$LiNaSO_4$ and $Li_2SO_4 \cdot H_2O$: Epitaxy and intergrowth phenomena. JOURNAL OF CRYSTAL GROWTH 148, 283-288.



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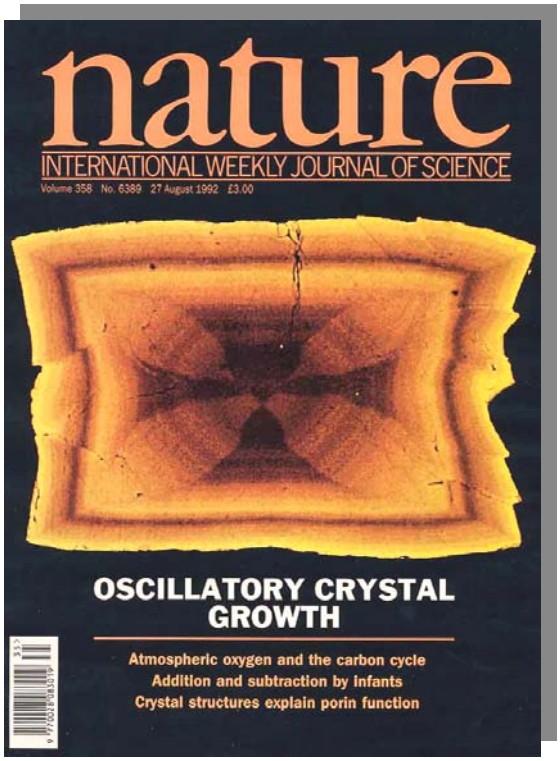

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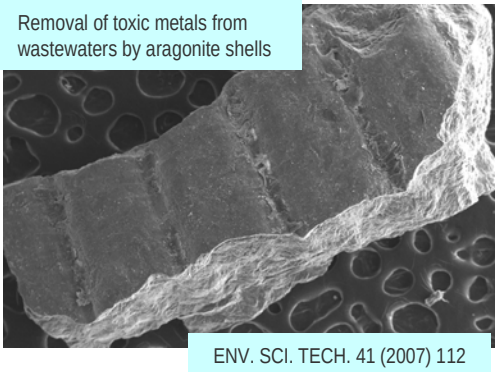

Removal of toxic metals from wastewaters by aragonite shells

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M. Prieto (2011) *Interfacial tension, metastability and the solubility of solid solutions*. 1ST ANNUAL WORKSHOP OF THE SKIN PROJECT (EURATOM EC FP7), Barcelona (Spain).

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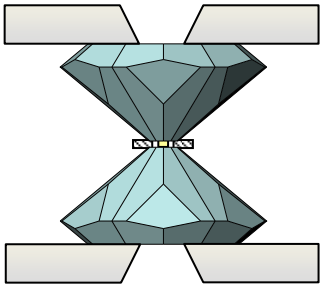

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PhD Supervision:

1989 Crystal growth mechanisms of aragonite type carbonates in diffusion-reaction systems: Mass - transfer and crystallization criteria. PhD student: Lourdes Fernández Díaz. Universidad Complutense de Madrid.

1989 Growth mechanisms of gypsum crystals in difussion systems: The role of mass-transfer, supersaturation and supersaturation rate. PhD student: Cristobal Viedma Molero. Universidad Complutense de Madrid.

1996 Crystallization of solid solutions in aqueous difussion-reaction systems. PhD student: Ángeles Fernández González. Universidad de Oviedo.

1996 Crystallization pathways in multicomponent solutions: Double salt formation in ternary systems M_2SO_4-Li_2SO_4-H_2O (M=Na, NH_4 and Rb). PhD Student: Carlos Pina Martínez. Universidad Complutense de Madrid. Co-Supervisor: L. Fernández Díaz.

2004 Physical chemistry and crystallization behaviour in solid solutions of anionic substitution: Systams $BaSeO_4$-$BaSO_4$-H_2O, $CaSeO_4$-$CaSO_4$-H_2O and $CaMoO_4$-$CaWO_4$-H_2O. PhD student: Ángel Andara. Universidad de Oviedo. Co-Supervisor: A. Fernández González.

2005 Interaction of cadmium-bearing solutions with biogenic and abiogenic carbonates. PhD student: Pablo Cubillas González. Universidad de Oviedo (International Doctorate). Co-Supervisor: A. Fernández González.

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2009 Thermodynamic and crystallographic relationships of the gypsum-brushite ($CaSO_4 \cdot 2H_2O$-$CaHPO_4 \cdot 2H_2O$) system. PhD student: Andre Jorge Pinto. Universidad de Oviedo (International Doctorate). Co-Supervisor: A. Jiménez Bautista.

2010 Multi-scale study of the interaction of $CaCO_3$ (calcite and aragonite) with metal-bearing aqueous solutions (Cd, Mn, Cu). PhD student: Carlos Pérez Garrido. Universidad Complutense de Madrid (International Doctorate). Co-Supervisors: Lourdes Fernández Díaz and José Manuel Astilleros.

2015 Removal of heavy metals (Cd^{2+}, Co^{2+}, Ni^{2+}, and Zn^{2+}) dissolved in fresh water and seawater by $CaCO_3$: A comparison. PhD student: Joana Filipa de Sousa Guerreiro Marques Carneiro. Universidad de Oviedo (International Doctorate). Co-Supervisor: Heather Stoll.

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