

Selected Publications of James Boles

GENERAL GEOLOGY

Boles, J.R. (1974) Structure, stratigraphy and petrology of mainly Triassic rocks, Hokonui Hills, Southland, New Zealand. *New Zealand Journal of Geology and Geophysics*, v. 17, No. 2, p. 337-374

Boles, J.R. (1986) Mesozoic sedimentary rocks in the Vizcaino Peninsula – Isla de Cedros area, Baja California, Mexico. In *Cretaceous stratigraphy western North America*, P. L. Abbott, ed., Soc. Econ. Paleon. Mineral., Pacific Sec., Book 46, p. 63-79

Busby-Spera, C.J. and Boles, J.R. (1986) Sedimentation and subsidence styles in Cretaceous forearc basin, Southern Vizcaino Peninsula, Baja California, Mexico. In *Cretaceous stratigraphy western North America*, P. L. Abbott, ed., Soc. Econ. Paleon. Mineral. Pacific Sec., Book 46, p. 79-90.

ZEOLITE DIAGENESIS

Boles, J.R. (1971) Synthesis of analcime from natural heulandite and clinoptillolite. *Amer. Mineral.*, v. 56, p.1724-1734.

Boles, J.R. and Surdam, R.C. (1971) Authigenesis of the Wagon Bed Formation, central Wyoming. *Contrib. to Geology*, v. 10, p. 141-144.

Boles, J.R. (1972) Composition, optical properties, cell dimensions, and thermal stability of some heulandite group zeolites. *Amer. Mineral.*, v. 57, p. 1463-1493.

Boles, J.R. and Surdam, R.C. (1973) A summary of authigenic aluminosilicates in the Green River and Wind River Basins of Wyoming. Wyoming Geol. Assoc. Guidebook, 25th Field Conf., p. 149-152.

Boles, J.R. and Coombs, D.S. (1975) Mineral reactions in Triassic tuffs from the Hokonui Hills, New Zealand. Geological Society of America Bulletin, v. 86, p. 163-173.

Boles, J.R. (1977) Zeolites in low-grade metamorphic grades. In Mineralogy and Geology of Natural Zeolites, Mumpton (ed.), Mineral. Soc. Amer., Reviews in Mineralogy, v. 4, p. 103-135.

Boles, J.R. (1977) Zeolites in deep sea sediments. In Mineralogy and Geology of Natural Zeolites, Mumpton (ed.), Mineral Soc. Amer., Reviews in Mineralogy, v. 4, p. 137-163.

Boles, J.R. and Coombs, D.S. (1977) Zeolite facies alteration of sandstones in the Southland Syncline, New Zealand. Amer. Jour. Sci., v. 277, p.982-1012.

Boles, J.R. and Wise, W.S. (1978) Nature and origin of deep-sea clinoptilolite. In Natural Zeolites, Occurrence, Properties, Use. L.B. Sand and F. A. Mumpton, (eds.). Pergamon Press. Oxford, p. 235-243.

Surdam. R. C., and Boles, J.R. (1979) Diagenesis of volcanic sandstones. Soc. Econ. Paleon. And Mineral. Spec. Publ. No. 26, p. 227-242.

Boles, J.R. and Surdam, R.C. (1979) Diagenesis of volcanogenic sediments in a Tertiary saline lake: Wagon Bed Formation, Wyoming. Amer. Jour. Sci., v. 279, p. 832-853.

Barnes, D., Boles J.R. and Hickey, J. (1984) Zeolite occurrences in Triassic-Jurassic sedimentary rocks, Baja California Sur, Mexico, 1984.

Proceeding 6th Intl. Zeol. Conference, D. Olson and A. Bisio, eds., p. 584-594.

Noh, J.H. and Boles, J.R. (1989) Diagenetic alteration of perlite in the Guryongpo, Republic of Korea. *Clays and Clay Minerals*, v. 37, p. 47-58.

Boles, J.R. (1991) Diagenesis during folding and uplift of the Southland Syncline, New Zealand. *New Zealand Journal of Geology and Geophysics*, v. 34, p. 253-259.

Boles, J.R. (1992) Zeolites in petroleum reservoirs. Extended abstract published at the fourth Argentine Sedimentology Meeting La Plata, Argentina.

Noh, J.H. and Boles, J.R. (1992) Origin of zeolite cements in Miocene sandstone, North Tejon Oil Field, California. *Journal Sedimentary Petrology*, v. 63, p. 248-260.

Boles, J.R. (2002) Review of Natural Zeolites: occurrence, properties, Applications. *Canadian Mineralogist* 40, 1521-1523.

CLASTIC DIAGENESIS- GEOCHEMISTRY - GENERAL

Boles, J.R. and Franks, S.G. (1979) Clay diagenesis in Wilcox sandstones of southwest Texas: Implications of smectite diagenesis on sandstone cementation. *Jour. Sed. Petrol.*, v. 49, p. 55-70. *Documents smectite to illite reaction and the effect of the resulting cement components on sandstones. One of the earliest papers to document the interaction of shales with sandstones.*

Boles, J.R. (1980) Principles of chemical diagenesis with applications to sandstone cementation. In 1980 Fall Education Conf., Amer. Assoc. Petrol. Geol. Short Course Notes, P. 1-82.

Boles, J.R. (1981) Clay diagenesis and effects on sandstone cementation (case histories from the Gulf Coast Tertiary). In Min. Assoc. Can. Short Course No. 7, Clays and the Resource Geologist, F.J. Longstaffe, (ed.), p. 148-168.

Boles, J.R. (1982) Principles of chemical diagenesis with applications in Gulf Coast Tertiary sandstones. Am. Assoc. Petrol. Geol. Clastic Diagenesis School, San Diego, California, 86 p. Republished in 1963, 1984, 1985.

Boles, J. R. (1984) Secondary porosity reactions in the Stevens Sandstone, San Joaquin Valley, California. In Clastic Diagenesis (eds. D. A. McDonald and R. C. Surdam), Am. Assoc. Petrol. Geol. Mem. 37, p. 217-224. *Documentation of carbonate cement and extensive plagioclase dissolution at North Coles Levee.*

Boles, J.R. (1987) Six million year diagenetic history, North Coles Levee, San Joaquin Basin, California. In Diagenesis of Sedimentary Sequences (ed. J.D. Marshall). Geol. Soc. Spec. Publ. No. 36, pp. 191-200. *Documents diagenetic history during the burial of an arkosic sandstone to depths of 3 km.*

Boles, J.R. (1989) Chemical analyses as indicators of sandstone petrology: an example from the North Coles Levee reservoir, California. International Spectroscopy and Geochemistry Symposium Transactions, Schlumberger. Doll Research, Ridgefield, Conn., Appendix AA, p. 1-5.

Fisher, J.B. and Boles, J.R. (1990) Water-rock interaction in Tertiary sandstones, San Joaquin basin, California, USA.: Diagenetic controls on water composition. Chemical Geology, v. 82, p. 83-101. *Formation water analyses and their relation to temperature and diagenesis.*

Documents formation water composition in San Joaquin oilfields including presence of organic acids and effects of plagioclase alteration on sodium-calcium content of water.

Boles, J.R. (1992) Evidence for oil-derived organic acids in reservoirs. Proceedings of the 7th International symposium on Water-rock interaction, Park City, Utah., eds. Kharaka, Y.K. and A.S. Maest, p. 311-314.

Boles, J.R. (1992) Diagenesis, eds. I.A. McLireath and D.W. Morrow. Sedimentology, v. 39, p. 171.

Boles, J.R. (1992) Prediction of reservoir quality through geochemical modelling, eds. I.D. Meshri and P.J. Ortoleva. Journal of Geochemical Exploration, v. 43, p. 293-297.

Boles, J.R. (1992) Diagenesis in a young arkosic hydrocarbon-bearing basin. Extended abstract published at the Fourth Argentine Sedimentology Meeting La Plata, Argentina.

Feldman, M.D., Kwon, S.T., Boles, J.R. and Tilton, G.R. (1993) Diagenetic mass transport in the southern San Joaquin Basin, California: Implications from the strontium isotopic composition of modern pore fluids. Chemical Geology, v. 110, p. 329-343. *Sr isotopic composition of San Joaquin oil field waters and their relation to feldspar and carbonate cement diagenesis.*

Boles, J.R., Hickey, J.J. and Frank, K. (1996) Early diagenesis of Fe minerals in response to marine and fresh water processes: Point McIntyre Field, North Slope, Alaska. Proceedings of the Fourth International Symposium of the Geochemistry of the Earth's Surface, Bottrell, S.H. Editor, p. 39-42. *Fe minerals (siderite, chlorite, pyrite) resulting from meteoric waters mixing with marine waters.*

Boles, J.R. and Hickey, J.J. (1997) Inhibition of quartz cementation by the presence of hydrocarbons, Point McIntyre Field, North Slope Alaska. Second International Conference on Fluid Evolution, Migration and Interaction in Sedimentary Basins and Orogenic Belts. Belfast, Ireland 10-14 March, 1997. Extended Abstract Volume, eds J.P. Hendry, P.F. Carey, J. Parnell, 272-274. *Quartz cementation inhibited in a gas cap.*

Wilson, A.M., Garvin, G. and Boles, J.R. (1999) Paleohydrology of the San Joaquin Basin, California. Geol Soc. Amer Bull., 111, 432-449.

Wilson, A.M., Boles, J.R. and Garven, G. (1999) Calcium mass transport and diagenesis of the Steven sandstone, San Joaquin basin, California. Geol. Soc. Amer. Bull. 112, 845-856.

Franks, S.G., Dias, R.F., Freeman, K.H., Boles, J.R., Holba, A., Fincannon, A.L. and Jordan, E.D. (2001) Carbon isotopic composition of organic acids in oil field waters, San Joaquin basin, California, USA. Geochim cosmochim Acta, 65, 1301-1310. *Demonstrates that the carbon isotopic composition of the carboxyl carbon is much heavier than the carbon in the alkane chain.*

Orphan, V.J., Goffredi, S.K., Delong, E.F and Boles, J.R. (2003) Geochemical Influence on Diversity and Microbial Processes in High Temperature Oil Reservoirs: Geomicrobiology Journal V. 20, p. 295-311. *Microprobes in high temperature oil wells of the San Joaquin basin.*

Rademacher, L., Clark, J.F. and Boles, J.R. (2002) Groundwater residence times and flow paths in fractured rock determined using environmental tracers in the Mission Tunnel; Santa Barbara County, California, USA: Environmental Geology 43, p. 557-567.

CARBONATE CEMENT IN SANDSTONE

Boles, J.R. (1978) Active ankerite cementation in the subsurface Eocene of southwest Texas. *Contrib. Mineral Petrol.*, v. 68, p. 13-22. *Documents the reaction of calcite to ankerite in deeply buried sandstones. Shows the thermodynamic reason for the stability of Fe carbonate at high temperature and the importance of the smectite to illite transition to the process.*

Boles, J.R. and Ramseyer, K. (1987) Diagenetic carbonate in Miocene sandstone reservoir, San Joaquin Basin, California. *Am. Assoc. Petrol. Geol. Bull.*, v. 71, no. 12, p. 1475-1487. *Documents carbonate cement history of turbidite sandstone throughout the San Joaquin basin using trace elements and isotopic studies.*

Schultz, J., Boles, J.R. and Tilton, G. (1989) Tracking calcium in the San Joaquin basin, California: A strontium isotopic study of carbonate cements at North Cole Levee. *Geochimica et Cosmochim. Acta*, v. 53, p. 1991-1999. *Documents plagioclase feldspar as a calcium source for sandstone carbonate cements.*

Wood, J.R. and Boles, J.R. (1991) Evidence for episodic cementation and diagenetic recording of seismic pumping events, North Coles Levee, California, U.S.A. *Applied Geochemistry*, v. 6, p. 501-521.

Hayes, M.J. and Boles, J.R. (1993) Evidence for meteoric recharge in the San Joaquin basin, California provided by isotope and trace element geochemistry. *Marine and Petroleum Geology*, v. 10, p. 135-144.

Lee, Y.H. and Boles, J.R. (1996) Depositional control on carbonate cement in the San Joaquin basin, California. In *Siliciclastic Diagenesis and Fluid flow: concepts and applications*, SEPM Spec Publ. no. 55, 13-22.

Boles, J.R. (1998) Carbonate cementation in Tertiary sandstones of the San Joaquin Basin. International Association of Sedimentology Special Publication No. 26 Carbonate Cementation in Sandstones, Morad, S., Editor. P. 261-284. *Overview of carbonate cements history, including isotopic studies.*

Mostafa, F., Harrison, T.M., Grove, M., Coath, C.D. and Boles, J.R. (2001) In situ stable isotopic evidence for protracted and complex carbonate cementation in a petroleum reservoir, North Coles levee, San Joaquin basin, California, USA. *Jour. Sed. Reser.* 71, 444-458.

Boles, J.R. (2004) Rapid growth of meter-scale calcite speleothems in the Mission Tunnel, Santa Barbara, CA: *Water Rock Interaction, Wanty and Seal (eds) II*, Taylor and Francis group, London, p. 353-356

Giles, G.F. and Boles, J.R. (2007) Geochemical signatures of rapid calcium carbonate crystallization in well scales: *Water Rock Interaction, Bullen and Wang (eds)*, Taylor and Francis group, London, p. 315-319.

Loyd, S.J., Dickson, J.A., Boles, J.R. and Tripathi, A.K. (2014) Clumped-isotope constraints on cement paragenesis in septarian concretions: *Journal of Sedimentary Research*, v. 84, p.1170-1184.

CONCRETION PAPERS

Boles, J.R., Landis. C.A. and Dale, P. (1985) The Moeraki Boulders - anatomy of some septarian concretions. *Jour. Sed. Pet.*, v. 55, p. 398-406.

Thyne, G. and Boles, J.R. (1989) Isotopic evidence for origin of the Moeraki septarian concretions, New Zealand. *Jour. Sed. Petrol.*, v. 59, p. 272-279.

FAULT DIAGENESIS-FLUID MOVEMENT

Eichhubl, and Boles J.R. (1997) Scale and dynamics of fracture-related fluid flow in the Miocene Monterey Formation, coastal California. Second International Conference on Fluid Evolution, Migration and Interaction in Sedimentary Basins and Orogenic Belts. Belfast, Ireland 10-14 March, 1997. Extended Abstract Volume, eds J.P Hendry, P.F. Carey, J. Parnell, 81-84.

Eichhubl, P., and Boles, J.R. (1998) Vein Formation in relation to burial diagenesis in the Miocene Monterey Formation, Arroyo, Burro Beach, Santa Barbara, California: in Eichhubl, P., ed. Diagenesis, Deformation, and Fluid Flow in the Miocene Monterey Formation: Pacific Section SEPM Special Publication, 83, 15-36.

Boles, J.R. and Grivetti, M. (2000) Calcite cementation along the Refugio/Carneros Fault, Coastal California: A link between deformation, fluid movement and fluid-rock interaction at a basin margin: Jour. Geochem Exploration, 69-70, 313-316.

Eichhubl, P. and Boles, J.R. (2000) Focused fluid flow along faults in the Monterey Formation, coastal California. Geol Soc. Amer. Bull., 112, 1667-1679.

Eichhubl, P. and Boles, J.R. (2001) Rates of Fluid Flow in Fracture Systems – Evidence for Episodic Fluid Flow in the Miocene Monterey Formation, Coastal California. Amer Journal Science, 300, 571-600.

Boles, J.R., Eichhubl, P., Graven, G. and Chen, J. (2004) Evolution of a hydrocarbon migration pathway along basin-bounding faults: Evidence from fault cement: AAPG Bulletin V. 88, No. 7, p. 947-970.

Perez, R.J. and Boles, J.R. (2004) Mineralization, fluid flow, and sealing properties associated with an active thrust fault: San Joaquin basin, California: AAPG Bulletin V. 88, No. 9, p. 1295-1314.

Boles, J.R., Homer, S. and Garven, G. (2010) Permeability Estimate for the South Ellwood Fault: Society of Petroleum Engineers, Publ # 133613, 10 p. *Estimates permeability along a 1 km deep fault from changes in gas seepage rates.*

Jung, B., Garven, G. and Boles, J.R. (2015) The geodynamics of faults and petroleum migration in the Los Angeles Basin, California: Journal of Science, vol. 315, page 412-459.

Boles, J.R., Garven, G., Camacho, H., Lupton, J.C. (2015) Mantle Helium Along the Newport-Inglewood Fault Zone, Los Angeles Basin, California -- A Leaking Paleo-Subduction Zone. to be published in Geochemistry, Geophysics, Geosystems, July 2015

LANDSLIDES--SPONTANEOUS COMBUSTION

Mariner, R.H., Minor, S.A., King, A.P., Boles, J.R., Kellogg, K.S., Evans, W.C., Landis, G.A., Hunt, A.G. and Till, C.B. (2008) A landslide in Tertiary marine shale with superheated fumaroles, Coast Ranges, California: The Geological Society of America. V. 36, no. 12, p. 959-962. *Temperatures up to about 250°C from spontaneous combustion apparently triggered by pyrite oxidation.*

Boles, J.R., Miller, G. F., and T.D., Wright (2010) Modern oil generation and pyrolysis at >800°C from spontaneous combustion in a landslide of Miocene shale, California: Geol. Soc. Amer. National Mtg., Denver, Colorado. *Spontaneous combustion resulting from oxidation in a landslide. Extremely high temperatures due to generation and combustion of oil.*

FELDSPAR DIAGENESIS

Boles, J.R. (1982) Active albitization of plagioclase, Gulf Coast Tertiary. Amer. Jour. Sci., v. 282, p. 165-180. *First documentation of P-T and fluid composition conditions of albitization.*

Boles, J.R. and Ramseyer, K. (1988) Albitization of plagioclase and vitrinite reflectance as paleothermal indicators, San Joaquin Basin. In Studies of the Geology of the San Joaquin Basin (ed. S. A. Graham), Pacific Section SEPM, vol. 60, p. 129-139.

Schultz, J., Boles, J.R. and Tilton, G. (1989) Tracking calcium in the San Joaquin basin, California: A strontium isotopic study of carbonate cements at North Cole Levee. Geochimica et Cosmochim. Acta, v. 53, p. 1991-1999. *Classic study using Sr isotopes to identify that calcium in carbonate cements originated from plagioclase.*

Hayes, M.J. and Boles, J.R. (1992) Volumetric relations between dissolved plagioclase and kaolinite in sandstones: implications for aluminum mass transfer in the San Joaquin basin, California. Society Econ. Paleon. Mineral, Special Publication No. 47, p. 110-123. *Demonstrates that aluminum usually conserved at a thin section scale.*

Ramseyer, K., Boles, J.R. and Lichtner, P.C. (1992) Mechanism of plagioclase albitization. Jour. Sed. Petrol., v. 62, p. 349-356.

Ramseyer, K., Diamond, L.W. and Boles, J.R. (1993) Authigenic K-NH₄-feldspar in sandstones: A fingerprint of the diagenesis of organic matter. Journal of Sedimentary Petrology, v. 63, p. 1092-1099. *One of*

the earliest documentations of NH₄ feldspar forming from ammonium released by early organic diagenesis.

Hirt, W.G., Wenk, H.R. and Boles, J.R. (1993) A mechanism for the albitization of plagioclase cores in the Steven sandstone (Moi.), San Joaquin Basin, California, and the Frio Formation (Olig.) Gulf Coast Texas – a TEM/AEM study. Geological Society of America Bulletin, v. 105, p. 708-714.

Lee, Y. II and Boles, J.R. (1995) Feldspar Diagenesis and Reservoir History of the Miocene Temblor Formation, Kettleman North Dome, California, USA. Korean Journal of Petrol, Geol., V. 3, No. 1, p. 16-27.

Perez, R. and Boles, J.R. (2005) An empirically derived kinetic model for albitization of detrital plagioclase. Amer. J. Sci. 305, 312-343. *Paper relates albitization to the time-temperature burial history.*

HYDROCARBON SEEPAGE

Boles, J.R., Cark, J.F., J.F., Washburn, L. and Leifer, I. (2001) Temporal variation in natural methane seep rate due to tides and other factors, Coal Oil Point area, California. Jour. Geophysical Research. 106. 27077-27086. *First analysis of tidal effects on seepage at an offshore seep capture tent. Showed high tide suppressed seep flux by about 8%.*

Boles, J.R., Eichhubl, P., Graven, G. and Chen, J. (2004) Evolution of a hydrocarbon migration pathway along basin-bounding faults: Evidence from fault cement: AAPG Bulletin V. 88, No. 7, p. 947-970. *Evidence of early hydrocarbon migration from breaking of seals at time scales of about a few hundred thousand years. Oldest record of hydrocarbon seepage from the SB Channel, based on dating of calcite at 120,000 to*

500,000 years. Indicates breaking of overpressured basin seals occurred at about this time

Leifer, I. and Boles, J.R. (2005) Turbine tent measurements of marine hydrocarbon seeps on subhourly timescales: *Journal of Geophysical Research V. 110, p.551-568.*

Leifer, I. and Boles, J.R. (2006) Corrigendum to: Measurement of marine hydrocarbon seep flow through fractured rock and unconsolidated sediment: *Marine and Petroleum Geology, Vol. 23, p. 401.*

Boles, J.R., Horner, S., and G. Garven (2010) Permeability estimate for the South Ellwood fault: SPE Western Regional Meeting, May 27-29, Anaheim, California. SPE Paper 133613, 10p. *Estimates permeability along a 1 km deep fault from changes in gas seepage rates.*

Boles, J.R., Edwards, M., Kamerling, M. and Valentine, D. (2012) Oil Seeps and Geology of the Santa Barbara Channel: 2012 AAPG Annual Convention Field Trip Guide, Coast Geological Society, 67 p.

PRESSURE SOLUTION-ELECTROCHEMICAL

Boles, J.R. and Johnson, K. (1983) Influence of mica surfaces on pore-water pH. *Chem. Geology, v. 43, p. 303-317. Early paper discussing the surface effects of muscovite versus biotite and their different effects on pore water chemistry. Fundamental experiments showing mica's ability to consume hydrogen ion and influence pH near the mica surface, which may cause carbonate/pyrite precipitation in biotite cleavage.*

Alcanter, N., Israelachvili, J. and Boles, J.R. (2003) Forces and ionic transport between mica surfaces: implications for pressure solution. *Geochim Cosmochim Acta* 67, 1289-1304.

Anzalone, A., Boles, J.R., Greene, G., Young, K., Israelachvili, J. and Alcanter, N. (2006) Confined fluids and their role in pressure solution: *Chemical Geology*, v. 230, p. 220-231.

Meyer, E.E., Boles, J.R., Greene, G., Israelachvili, J. and Alcanter, N. (2006) Experimental investigation of the dissolution of quartz by a muscovite mica surface: Implications for pressure solution: *Journal of Geophysical Research*, Vol. 111, B08202.

Greene, G.W., Kristiansen, K., Meyer, E.E., Boles, J.R. and Israelachvili, J.N. (2009) Role of electrochemical reactions in pressure solution: *Geochimica et Cosmochimica Acta*, v. 7, p. 2862-2874.
Seminal paper showing the effect of electrochemical potential resulting from overlapping double layers and its effect on quartz dissolution.

Kristiansen, K., Valtiner, M., Greene, G.W., Boles, J.R. and Israelachvili, J.N. (2011) Pressure solution – The importance of the electrochemical surface potentials : *Geochim Cosomochim Acta*, 75, 6882-6892. *Seminal paper showing the effect of electrochemical potential resulting from overlapping double layers and its effect on quartz dissolution. Fundamental experimental and petrographic evidence showing that electrical chemical potential is the driving force for “pressure solution”.*

CONCRETION PAPERS

Boles, J.R., Landis, C.A. and Dale, P. (1985) The Moeraki Boulders - anatomy of some septarian concretions. *Jour. Sed. Pet.*, v. 55, p. 398-406.

Thyne, G. and Boles, J.R. (1989) Isotopic evidence for origin of the Moeraki septarian concretions, New Zealand. *Jour. Sed. Petrol.*, v. 59, p. 272-279.

