

casting against the surface of Ayer granite, with areas of 100-900 sq cm, coupled with profilometer tests on the surface and finite element simulation, support the proposed theory.

Physico-chemical properties

See also: 912013, 912233

912120

Tritium, oxygen-18, and deuterium diffusion at the Confederation Road landfill site, Sarnia, Ontario, Canada
Yanful, E K; Quigley, R M

Can Geotech J V27, N3, June 1990, P271-275

The closed domestic landfill site is founded on about 30m of massive, saturated till. Measurements of the environmental isotopes H-2, H-3, and O-18 at the site, 16 years after placement, are presented. Diffusion coefficients are evaluated, as are those of Na and Cl ions for comparison. O-18 and deuterium have migrated furthest, then tritium and Cl, followed by Na, which may be retarded by adsorption onto clay exchange sites. The H-3 profile indicates the presence of post 1953 rainfall, which probably entered in 1967 during excavation of the landfill trench. Isotopic enrichment in the top 1.25m below the waste may have biological origins.

912121

Combined liners for waste disposals - tests on the behaviour under thermal loads (In German)

Brauns, J; Dittmar, C; Gottheil, K M

Geotechnik V13, N3, 1990, P135-141

Full depth models of base liners for landfill sites, consisting of 75cm of clayey soil topped with an impermeable membrane and resting on a free-draining layer representing the subsoil, were tested in the laboratory. Specimens were held with top and base temperatures maintained at 40 and 15 deg C respectively. Moisture diffusion and shrinkage cracking occurred, resulting in loss of contact between the sample and its container and surface settlements. In situ consequences are considered.

912122

Fracture apertures from electrical borehole scans

Luthi, S M; Souhaite, P

Geophysics V55, N7, July 1990, P821-833

The Formation Microscanner provides high resolution electrical scans of borehole walls. Three dimensional finite element analysis is used to investigate the response of a fractured formation to such devices. A relation is developed which represents fracture aperture in terms of formation and mud resistivities and the additional current flow caused by the presence of the fracture. Numerical coefficients of the equation are evaluated by forward modelling. Results using data from a well in Moodus, Connecticut, indicate the method successfully traces fractures seen on the Formation Micro Scanner image, with limiting resolution at about 1 micron aperture.

912123

Specifications for clayey raw materials used to produce expanded lightweight aggregates (In French)

Coungny, G

Int Assoc Engng Geol Bull N41, April 1990, P47-55

Clayey materials are not always a suitable base for industrial production of lightweight aggregates even if they expand under laboratory conditions. Raw materials must meet chemical, mineralogical, and grain size specifications. Desired end properties and production methods are briefly outlined. The

expansion process is explained and the influence of clay minerals discussed. An improved quaternary representation of favourable composition is presented to supersede the widely used ternary diagram of Riley (1951).

912124

Laboratory studies of the electrical conductivity of silicate perovskites at high pressures and temperatures

Li, X; Jeanloz, R

J Geophys Res V95, NB4, April 1990, P5067-5078

All major upper mantle minerals transform to perovskite structured phases or to a perovskite-magnesiowustite assemblage at lower mantle conditions. AC and DC electrical conductivities of these materials at pressures to 80MPa and temperatures to 3500 deg K were measured in the laboratory. Conductivity is low (10^{-3} S/m) at lower mantle conditions. Activation energies for electrical conduction are 0.1-0.4eV, indicating an extrinsic electron process. Results are consistent with earlier DC measurements. High conductivities derived from geomagnetic studies require other components than those discussed.

912125

Diffusion of hydrogen in olivine: implications for water in the mantle

Mackwell, S J; Kohlstedt, D L

J Geophys Res V95, NB4, April 1990, P5079-5088

Single crystals of olivine were annealed at temperatures 800 and 1000 deg C, confining pressure 300MPa, under hydrothermal conditions. Hydrogen diffusivity along several crystallographic directions was determined from concentration profiles of hydroxyl in the samples. Rates of diffusion were anisotropic. Measured diffusion coefficients indicate that hydrogen content of mm size crystals will equilibrate with the environment in a matter of hours. As xenoliths ascend from the mantle, experiencing high temperature but rapid pressure decrease, olivine grains may thus dehydrate. Consequently low measured hydrogen content does not necessarily mean low mantle water content.

912126

Deconvolution of mineral absorption bands: an improved approach

Sunshine, J M; Pieters, C M; Pratt, S F

J Geophys Res V95, NB5, May 1990, P6955-6966

Visible and near infra-red spectra contain absorption bands which are characteristic of composition and structure of absorbing species, but extracting data from complex spectra is difficult. The commonly used Gaussian model of absorption bands is evaluated and some inadequacies for describing pyroxene spectra are exposed. Modification to overcome these problems is presented, and it is shown the improved model can successfully describe electron transition absorptions in pyroxene, pyroxene mixtures, and olivine spectra.

912127

Electrical conductivity of olivine, a dunite, and the mantle

Constable, S; Duba, A

J Geophys Res V95, NB5, May 1990, P6967-6978

The most reliable data on electrical conductivity of rock forming minerals have to date come from single crystal experiments. These are extended by the study of conductivity of a North Carolina dunite at temperatures 600-1200 deg C under conditions of controlled oxygen fugacity. Conductivity as a function of temperature and oxygen fugacity was indistinguishable from that of single crystal olivine. This suggests no

enhancement factor is necessary when extrapolating single crystal data to describe crustal properties. Three conductivity mechanisms are seen across the temperature range.

912128

Borehole determination of formation thermal conductivity using a thermal pulse from injected fluid

Silliman, S E; Neuzil, C E

J Geophys Res V95, NB6, June 1990, P8697-8704

The thermal conductivity of a formation can be determined from analysis of dissipation of the heat pulse resulting from injection of a fluid at arbitrary temperature into a thermally equilibrated borehole. When this was applied to pouring of diesel fuel into a borehole in shale, thermal conductivity estimated was very close to that measured on cores. The technique may be applied simultaneously to multiple horizons. Improvements to the method, adding the liquid in a controlled manner, such as by a tremie pipe, are suggested.

912129

Thermophysical properties of the earth's crust: in situ measurements from continental and ocean drilling

Williams, C F; Anderson, R N

J Geophys Res V95, NB6, June 1989, P9209-9236

Deep drilling experiments allow calibration of empirical and theoretical models relating crustal thermal properties to physical and chemical properties. Data have been collected from over 30000 well log measurements of wave velocity, density, porosity, and radioclement and major element chemistry in formations of varying ages in rocks from granitic to gabbroic. They have been used as input into two new techniques for estimating thermal conductivity and heat production, and output is compared to in situ measured values.

912130

Electrical properties of mid-ocean ridge basalt and implications for the structure of the upper oceanic crust in hole 504B

Pezard, P A

J Geophys Res V95, NB6, June 1990, P9237-9264

Resistivity, porosity, and cation exchange capacity of mid-ocean ridge basalt samples were measured in the laboratory. The presence of alteration products in some layers and pillars is reflected in high values of CEC. In massive units, porosity and intrinsic formation factor are related by an inverse power law. Continuous resistivity profiles delineated large scale seismic layers and individual lithologic units. Massive flows in the extrusive layers act as permeability barriers constraining fluid flow. Such barriers separate low temperature seawater alteration and higher temperature alteration phases. Porosity estimates from in situ resistivity measurements are consistent with those from packer experiments.

912131

Rapid and secondary sorption of benzene and toluene by two aquifer solids

Ahlert, W K; Uchirin, C G

J Hazard Mater V23, N3, July 1990, P317-330

Static batch and through-flow column studies were used to examine the adsorption/desorption of two organic pollutants for two natural aquifer soils from New Jersey, USA. The effects of soil organic content and the nature of the contaminant were investigated. Long term effects after the initial rapid adsorption/desorption process are discussed, in particular the role of secondary pore diffusion.

912132

Numerical modelling of the thermomechanical behaviour of a granitic mass - application to the simulation of Fanay-Augeres THM experiment (In French)

Rejeb, A; Vouille, G; Derlich, S

Rev Fr Geotech N53, 1990, P21-31

Heater tests to study the thermo-hydro-mechanical (THM) behaviour of a granite rock mass are described. The database of results obtained can be used for validation of numerical models of THM behaviour of a fractured granitic mass. Field measurements are presented, together with initial results from finite element models CHEF (thermoelastic) and VIPLEF (thermoplastic) in an equivalent continuous medium, for purposes of comparison.

912133

Radiogenic heat production measured by laboratory and bore hole methods, a comparison

Haack, U; Gohn, E; Bucker, C; Zoth, G

Sci Drilling V1, N5, 1990, P211-216

Radiogenic heat production exerts considerable influence on crustal temperature field and endogenic activity. Heat production rate is generally determined from measurements of natural gamma activity, either in the laboratory, which is time consuming, or by borehole logging, which requires laboratory correlation. Results are compared from borehole gamma logging, laboratory measurements on rock cuttings, and laboratory measurements on rock flour and powdered cores. General correlation is good, but there are some differences between the two sets of laboratory results, which may or may not be real. This must be established, as rock flour constitutes the major type of sample for most boreholes.

912134

Thermal conductivity profile of the KTB pilot corehole

Huenges, E; Burkhardt, H; Erbas, K

Sci Drilling V1, N5, 1990, P224-230

Thermal conductivities of about 500 cores from the KTB pilot bore have been measured in the laboratory. Metabasic rocks showed isotropic thermal conductivities of 2.5-2.6 W/mK, but for gneisses they were anisotropic along the foliation, 3.0 and 3.6 W/mK respectively perpendicular and parallel to the foliation. Dip and foliation of the gneissic intervals along the bore must thus be taken into account when calculating heat flows from borehole temperature data.

912135

Thermoluminescence as a scalar measure of plastic strain in experimentally and naturally deformed crystalline limestones

Bergues, J; Chaye d'Albissin, M

Tectonophysics V172, N3 4, Feb 1990, P223-234

Thermoluminescence (TL) sensitivity of minerals is known to change with deformation. A new TL peak occurs for limestone, which is experimentally correlated with the translational gliding rather than the intracrystalline twinning mode of deformation. Laboratory triaxial tests at room temperature show loading causing dilation does not give rise to the new TL peak, but that the peak grows in proportion to increasing strain at constant volume plastic deformation. This is applied to naturally deformed rocks, and TL used to classify limestones according to their relative plastic deformations.