

Index

Page numbers in *italics* refer to Figures and page numbers in **bold** refer to Tables

- accretionary wedges, fluid migration 36, 37–38
- advection porosity 11
- air, thermal conductivity **46**
- air entry value 109
- albite, thermal conductivity **46**
- anhydrite, thermal conductivity **46**
- apparent diffusion coefficient 12
- aragonite, dissolution 75

- Barbados accretionary complex 37, 38
- Bartonian Clay 177
 - groundwater chemistry 179, 180
 - modelling 181–186
- Belgium *see* Boom Clay *also* Ledo–Paniselian aquifer
- bentonite
 - gas permeability 113, 114, 115–120
 - shrinkage 110
- beta factor 73
- Boom Clay Formation 176
 - gas permeability 113, 114, 115–120
 - porosity 17, 18
 - undrained shear deformation 64–65
- boulder clay (till)
 - hydraulic performance test
 - method 99–101
 - results 101–105
 - porosity 17–18
- brittle *v.* ductile behaviour 127
- brittle–ductile transition 67–68
- brittleness index 129, 131
- bulk density
 - Conasauga Group 163
 - Not Formation 143

- calcite, thermal conductivity **46, 57**
- Cambrian *see* Conasauga group
- capillary sealing 125–126
- carbonates
 - chemical compaction 75
 - diagenesis 34
 - thermal conductivity **56**
- cation exchange capacity 180
- cementation, effect on dilatancy 129
- chemistry of groundwater
 - Eocene of Belgium 178–181
 - PHREEQM model 181–186
- chlorite, thermal conductivity **57**
- clastic intrusions 37
- clay
 - defined 2, 24
 - thermal conductivity **56**
- clay minerals
 - diagenesis 34
 - swelling 16

- claystone
 - defined 2
 - thermal conductivity **56**
- compaction
 - effect on fluid flow 75–77
 - types
 - chemical 75
 - mechanical 73–75
- compaction curves 145–146
- compaction disequilibrium 145–146
- Conasauga Group
 - effective porosity study
 - method 160–163
 - results 164–165
 - results discussed 165–167
 - role in contaminant transport 167–170
 - tectonic setting 158
- connected porosity 9–10
- consolidation state 98–99
- consolidation testing
 - experimental design 80–82
 - results 82–87
- contaminant transport *see* Conasauga Group

- Darcy velocity 11
- Darcy's Law 23, 75
- deformation rate, effect on fluid flow 98
- desiccation 109, 110
- diagenesis
 - chemical reactions 34
 - effect on dilatancy 129
- diffusion porosity 12–15
- dilatancy onset 127–128
 - effect of overconsolidation ratio 129
- divided bar method for thermal conductivity 48, 50–51
- dolomite, thermal conductivity **46, 57**
- ductile *v.* brittle behaviour 127
- ductility estimation
 - friction angle effect 129–130, 132
 - overconsolidation ratio effect 128–129
 - unconfined compressive strength effect 129

- effective diffusion coefficient 12
- effective porosity 9, 11
 - method of measurement 160–163
 - results 164–165
 - results discussed 165–167
- embrittlement prediction
 - friction angle effect 129–130, 132
 - overconsolidation ratio effect 128–129
 - unconfined compressive strength effect 129
- Eocene sediments of Belgium
 - cation exchange capacity 180
 - groundwater flow 176–178

- hydrogeochemistry 178–180
 - modelling 181–186
 - stratigraphy 176
- expansion, role in overpressure 77
- extension fractures, role in leakage 126
- failure envelope 68–70
- failure in mudrocks 61–62
 - modelling behaviour 67–70
 - undrained shear deformation experiments
 - Boom Clay 64–65
 - Kimmeridge Clay 63–64
 - London Clay 65–67
 - mud volcano clays 62
 - North Sea shale 65
 - Todi Clay 62–63
- faults
 - conducting behaviour 36–38
 - density mapping 133
 - effect on seal leakage 130–131, 132
 - seal behaviour 36
- feldspar, thermal conductivity **46, 57**
- Fick's Laws 12
- Flanders *see* Ledo-Paniselian aquifer
- flocculation 99
- flow equations *see* fluid flow
- fluid flow
 - equations 108
 - factors affecting 98–99
 - effect of permeability anisotropy 97
 - modelling with Darcy's Law 75–77
 - see also* hydraulic conductivity
- fluid flux 11
- fluid pressure studies *see* Halten Terrace
- fluidization 37
- fracture porosity 10
- fractures
 - effect on permeability 35–36
 - effect on thermal conductivity 52
 - role in leakage 126–127
- friction angle 129–130, 132
- Fuller's Earth, thermal conductivity **50, 51, 57**
- Garn Formation, porosity 142
- gas, thermal conductivity **46**
- gas permeability
 - experimental determination
 - equipment 111–112
 - method 113–115
 - results 115–120
 - results discussed 120–121
 - samples 113
- Gault Clay, air entry value 109
- Gent Formation 176
- geochemical porosity 9, 15–16
- geochemistry of groundwater
 - Eocene of Belgium 178–181
 - PHREEQM model 181–186
- gibbsite, dissolution 75
- glacial clays
 - hydraulic performance test
 - method 99–101
 - results 101–105
- grain density, Conasauga Group 163
- grain orientation, effect on fluid flow 99
- grain shape
 - effect on pore size 30
 - effect on thermal conductivity 52–53
- grain size
 - effect on pore size 30
 - effect on thermal conductivity 52
- groundwater flow, Eocene of Belgium 176–178
- Hagen-Poiseuille equation 27
- halite, thermal conductivity **46**
- Halten Terrace 138
 - compaction disequilibrium 145–146
 - fluid pressure distribution 139–141
 - fluid pressure–porosity relations 141–145
 - lateral pressure transfer 147
 - mass balancing in fluid flow calculation 149–150
 - modelling fluid pressure buildup 146
 - Rås Basin overpressure 147–149
 - sedimentation rates 145
 - stress history 151–152
- heat flow equations 45
- Heather Formation, thermal conductivity **50**
- helium porosimetry 162–163
- hydraulic conductivity
 - effect on deformation 98
 - experimental determination
 - method 99–101
 - results 101–105
 - results discussed 105–106
 - Eocene of Belgium 176–178
 - London Clay 27
- hydrogeochemistry
 - Eocene of Belgium 178–181
 - PHREEQM model 181–186
- Ile Formation, porosity 142
- illite
 - precipitation 75
 - role in diagenesis 34
 - thermal conductivity **46, 57**
- illite–smectite, thermal conductivity **46**
- immersion porosimetry 161–162
- in-diffusion porosity experiments 14
- internal friction 129–130, 132
- K-feldspar, thermal conductivity **46**
- kaolinite
 - dissolution 75
 - permeability experiment
 - material 80
 - method 80–82
 - results 82, 83, 88, 89, 90, 91
 - results discussed 92–94
 - thermal conductivity **46, 57**
- Keuper Marl, vein patterns 37
- Kimmeridge Clay
 - thermal conductivity **50, 51, 57**
 - undrained shear deformation 63–64

- Klakk Fault Complex 139, 150, 151
 Knesselare Formation 176
 Kortrijk Formation 176
 Kozeny–Carman equation 27
- landfill sites
 liner hydraulic performance 97–98
 experimental testing
 method 99–101
 results 101–105
 results discussed 105–106
 layering, effect on thermal conductivity 49, 52
 leak-off pressure 35
 leakage of top seals *see under* top seals
 Lede Formation 176
 Ledo–Paniselian aquifer
 cation exchange capacity 180
 groundwater flow 176–178
 hydrogeochemistry 178–180
 modelling 181–186
 stratigraphy 176
 limestone, thermal conductivity **56**
 London Clay
 air entry value 109
 experimental porosity measurement 14, 16, 17
 hydraulic conductivity 27
 pore size distribution 30–32
 thermal conductivity **50, 51, 57**
 undrained shear deformation 65–67
- Maldegem Formation 176
 marine clay
 permeability experiment
 material 80
 method 80–82
 results 86, 87, 88, 92
 results discussed 92–94
 mass balancing, fluid flow calculations 149–150
 matric suction 108, 110
 matrix porosity 10
 mercury porosimetry 162
 mica, thermal conductivity **46**
 microfractures, effect on permeability 35–36
 mineralogy, effect on thermal conductivity 52
 moisture characteristic 109
 moisture content 10
 molality 9
 molarity 9
 montmorillonite
 compaction 73
 permeability experiment
 material 80
 method 80–82
 results 82, 85, 89
 results discussed 92–94
 mud, defined 2
 mud volcano clay, undrained shear deformation 62
 mudstone
 defined 2, 24
 thermal conductivity **56**
- needle probe method for thermal conductivity 49, 50–51
 North Sea Basin
 mudstones
 intraformational polygonal faults 37
 porosity data 32
 shale, undrained shear deformation 65
 thermal conductivity **56**
 thermal history 46, 47
 Not Formation
 bulk density 143
 compaction curve 146–147
 formation porosity 144
- Oak Ridge Reservation, Conasauga Group porosity study
 method 160–163
 results 164–165
 results discussed 165–167
 significance in contaminant transport 167–170
 ODP leg 141 marine clay
 permeability experiment
 material 80
 method 80–82
 results 86, 87, 88, 92
 results discussed 92–94
 oil, thermal conductivity **46**
 Oligo-Miocene clay *see* Boom Clay
 Opalinus Clay, porosity **17, 18**
 orthoclase *see* K-feldspar
 out-diffusion porosity experiments 14
 overconsolidation ratio (OCR) 98, 128–129
 overpressure
 causes 137, 140
 development in Rås Basin 148–149
 modelling buildup 146
 role in fluid flow 75–77
 role of Plio-Pleistocene loading 145–146
 Oxford Clay
 porosity effects 52
 thermal conductivity **50, 51, 57**
- Palfris Marl, porosity **17, 18**
 particle orientation, effect on fluid flow 99
 permeability 23–25
 anisotropy of 79–80
 effect on fluid flow 97
 experimental measurement 80–82
 experimental results 82–89
 results discussed 89–94
 diagenetic effects 34
 effect of void ratio 79
 fault effects 34–38
 pore size effects 30–34
 modelling 25–26
 empirical 26–27
 theoretical 27–30
 role in top seals 125
 permeability *see also* gas permeability
 physical porosity 9, 10–11
 polygonal faults 37

- pore geometry, effect on fluid flow 97
 pore pressure, relation to deformation 98
 pore size distribution 30–34
 pore throat size 30, 163–164
 porosimetry, mercury intrusion method 30
 porosity
 concept 9–10
 effect of overpressure 137
 effect on thermal conductivity 52
 modelling influence of fluid pressure 146
 relation to fluid pressure 141–145
 see also effective porosity
 porosity–permeability, relationship 24, 25
 pressure, effect on thermal conductivity 54
 pyrite, thermal conductivity **46, 57**
- quartz
 effects on thermal conductivity 52
 thermal conductivity **46, 57**
- radial diffusion method 16
 Rås Basin 147–148
 overpressure 148–149
 relative permeability 108
 rheology mapping 133
- salinity, relation to geochemical porosity 16
 sandstone
 compaction 74
 thermal conductivity 48, **56**
- scanning electron microscopy, consolidated clays 87–89
- Scottish boulder clay *see* boulder clay
 seals *see* top seals
 s.e.m. *see* scanning electron microscopy
 shale
 defined 2
 thermal conductivity **56**
- shear *see* undrained shear deformation
 shear fractures
 formation 127
 role in leakage 126–127
- shear zones 97
 shrinkage tests 109
 siderite, thermal conductivity **46**
- silt, defined 2
 siltstone
 defined 2
 thermal conductivity **56**
- silty clay
 permeability experiment
 material 80
 method 80–82
 results 82, 84, 87–88
 results discussed 92–94
- smectite
 dissolution 75
 thermal conductivity **57**
- smectite-illite, diagenesis 34
 Sweden *see* Opalinus Clay *also* Palfris Marl
- temperature, effect on thermal conductivity 54
 Tertiary *see* Eocene *also* Oligo-Miocene
 texture, effect on thermal conductivity 52–54
 thermal conductivity
 experimental measurement 48–51
 mathematical expression 46
 modelling 46–48
 factors affecting 51–54
 model types 54–58
 problems in measuring 45
 thermal expansion, role in overpressure 77
 through-diffusion porosity experiments 13–14
 Tilt Formation 176
 till *see* boulder clay
 Todi Clay, undrained shear deformation 62–63
 top seals
 embrittlement estimation
 friction angle 129–120, 132
 overconsolidation ratio 128–129
 unconfined compressive strength 129
 fault effects 130–131, 132
 leak mechanisms
 effect of dilatancy 127–128
 extension fractures 126
 shear fractures 126–127
 leak risk analysis 133
 role in permeability 125
 tortuosity 99
 total porosity 9
 transport porosity 9, 11–15
 trap integrity *see also* top seals 133
 Trinidad Clay **62**
- unconfined compressive strength (UCS) 129
 undercompaction prediction 146–147
 undrained shear deformation experiments
 Boom Clay 64–65
 Kimmeridge Clay 63–64
 London Clay 65–67
 mud volcano clays 62
 North Sea shale 65
 Todi Clay 62–63
- void ratio change 73, 79
 void volume 9
 Vøring Basin, thermal conductivity 58
- water, thermal conductivity **46**
 water retention function 109
 Welsh boulder clay *see* boulder clay
 Whiteoak Mountain thrust sheet 158, 159
 effective porosity study
 method 160–163
 results 164–165
 results discussed 165–167
 significance in contaminant transport 167–170
- Zelzate Formation 176