VIRTUAL PPS

Petrophysical Response of Common Minerals

Probabilistic Mineral Model Input Parameters

by

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Mineral Classification	Mineral Name	Chemical Elements	RHOB Bulk Density (gm/cm3)	PEF Photoelectric Factor (barns/electron)	U Volumetric Photoelectric Factor (barns/cm3)	NPOR Thermal Neutron Porosity (p.u.)	SIGMA Capture Cross Section (c.u.)	DT P-Wave Slowness (us/ft) (us/metre)	TPL Electromag Propagation Time (nsec/m) (@ 100 deg)	GR Gamma Ray (API)	POTA Potassium (wt %)	THOR Thorium (ppm)	URAN Uranium (ppm)
Silica	Quartz	SiO2	2.65	1.81	4.80	-2.1	4.55	50.4 / 165.3	7.2	0.0	0.00	0.5 -> 6.0	0.1 -> 5.0
	Sphene	CaTiOSiO4	3.48	7.12	24.40	3.6	71.94			> 10000	0.00	100 -> 600	100 -> 700
	Tourmaline	NaMg3Al6B3Si6O27(OH)4	3.03	1.43	4.30	37.4	4347.00			0.0	0.00	0.0	0.0
	Zircon	ZrSiO4	4.51	70.04	307.43	0.9	5.52	95.8 / 314.3		> 2800	0.00	50 -> 4000	1450 -> 4600
Feldspars	Orthoclase	KAlSi3O8	2.54	2.86	7.29	-1.1	15.82	53.5 / 175.5	7 -> 8.2	235 -> 275	10.50	0.0	1.2 -> 2.6
	Plagioclase	NaAlSi3O8	2.58	1.68	4.34	-1.3	7.64	47.2 / 154.9	7 -> 8.2	4 -> 57	0.30	0.0	1.9 -> 6.0
Micas	Muscovite	KAl2(AlSi3O10)(OH)2	2.83	2.40	6.77	16.5	17.06	47.2 / 154.9	8.3 -> 9.4	270.0	8.70	0.0	8.1
	Biotite	K(Mg,Fe)3(AlSi3O10)(OH)2	3.20	8.70	27.54	22.5	35.09	49.4 / 162.1	7.2 -> 8.1	275.0	6.95	0.0	2.6 -> 48
Carbonates	Calcite	CaCO3	2.71	5.08	13.76	0.0	7.08	47.5 / 156	9.1	0.0	0.00	0.0	0.0
	Dolomite	CaMg(CO3)2	2.85	3.14	8.91	0.5	4.70	45.5 / 149.3	8.7	0.0	0.00	0.0	0.0
	Siderite	FeCO3	3.91	14.51	55.56	12.9	52.80	43.8 / 143.7	8.7	< 5.0	0.00	0.0	0.0
	Ankerite	Ca(Fe,Mg)(CO3)2	3.08	8.44	25.77	5.7	26.90	44.0 / 144.3		0.0	0.00	0.0	0.0
Sulphides	Pyrite	FeS2	5.00	16.97	82.25	-1.9	90.52	37.6 / 123.3		0.0	0.00	0.0	0.0
Sulphates	Anhydrite	CaSO4	2.98	5.06	14.95	-0.7	12.45	51.8 / 170.0	8.4	0	0.00	0.0	0.0
Phosphates	Fluorapatite	Ca5(PO4)3F	3.21	5.82	18.48	-0.2	10.23	44.8 / 147		120 -> SAT	0.00	0.0	47 -> 62
Coals	Lignite	C H0.849 N0.015 O0.211	1.23	0.20	0.27	54.2	12.90	160 / 525		10 -> 25	0.00	0.0	0
Clays	Kaolinite	Al4(Si4O10)(OH)8	2.62	1.70	4.46	45.1	13.04	211.7 / 694.6	8.0	80 -> 130	0.49	7 -> 47	1 -> 12
Illites	Illite	K.8(Al1.6Fe.2Mg.2)(Si3.4Al.6)O10(OH)2	2.77	3.03	8.37	15.8	16.74		8.0	130 -> 235	4.91	8 -> 25	1 -> 5
	Glauconite	K.7(Fe.7Al1.3)(Si3.3Al.7)O10(OH)2	2.85	4.79	13.60	17.5	20.89		8.0	155 -> 210	5.10	2 -> 8	0.0
Smectites	Montmorillonite	Na.33(Al1.67Mg.33)(Si4O10)(OH)2 + 4H2O	2.11	2.11	4.53	50.0	13.97		8.0	140.0	0.38	10 -> 22	1 -> 4
Chlorites	Mg Chlorite	(Mg5Al)Si3AlO10(OH)8	2.67	1.39	3.71	42.8	11.34		8.0	180 -> 250	0.00	3 -> 8	0.0
	Fe Chlorite	(Fe5Al)Si3AlO10(OH)8	3.40	12.36	41.43	>60	47.44		8.0	180 -> 250	0.00	3 -> 8	0.0
Fluids	Water (0 ppm)	H2 O	1.00	0.44	0.40		22.00	189.0 / 620	26	0	0.00	0.0	0
	Water (35 kppm)	H2O(0.965) NaCl(0.035)	1.02	0.61	0.54		32.00	189.0 / 620	42	0	0.00	0.0	0
	Water (70 kppm)	H2O(0.93) NaCl(0.07)	1.05	0.85	0.74		46.00	189.0 / 620	53	0	0.00	0.0	0

Notes:

Reference: Schlumberger 1990 Element Mineral Rock Catalog

Muscovite and Biotite commonly decompose to form authigenic clays (i.e. chlorite).

Micro porous clays assosciated with micas are Chlorite, Illite, Illite-Smectite, Glauconite-Smectite mixtures.

Biotite is usually associated with Pyrite from the decomposition of this mica mineral with kaolinite and illite.

Detrital heavy minerals of Zircon and Tourmaline are visible in clean reservoir sands.

Feldspar dissolution develops micro/secondary porosity. Kaolin is formed during dissolution.

Granitic trace minerals cause saturated GR responses: Zircon, Sphene

Radioactive Isotopes: Potassium 40, Thorium 232, Uranium 238

Version 1: 16/11/92
Version 2: 18/04/94
Version 3: 22/12/94
Version 4: 14/07/95 (EXCEL)
Version 5: 29/06/2001 (MPN)
Version 6: 16/02/2016 (ViruaIPPS)

Common Clastic Mineral Model - Marine / Fluvial

Structural Grains
- Quartz
- Potassium Feldspar

Structural & Authigenic Clays
- Kaolinite
- Mixed layer Illite-Smectite

Diagenetic Cements/Precipitates
- Dolomite
- Calcite
- Pyrite
- Siderite