

Petrophysical Response of Common Minerals

Probabilistic Mineral Model Input Parameters

by  
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			RHOB	PEF	U	NPOR	SIGMA	DT	TPL	GR	POTA	THOR	URAN	
Mineral Classification	Mineral Name	Chemical Elements	Bulk Density	Photoelectric Factor	Volumetric Photoelectric Factor	Thermal Neutron Porosity	Capture Cross Section	P-Wave Slowness	Electromag Propagation Time	Gamma Ray	Potassium	Thorium	Uranium	
			(gm/cm3)	(barns/electron)	(barns/cm3)	(p.u.)	(c.u.)	(us/ft) (us/metre)	(nsec/m) (@ 100 deg)	(API)	(wt %)	(ppm)	(ppm)	
<b>Silica</b>	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	
<b>Feldspars</b>	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	
<b>Micas</b>	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	
<b>Carbonates</b>	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	
<b>Sulphides</b>	Pyrite	FeS2	5.00	16.97	82.25	-1.9	90.52	37.6 / 123.3		0.0	0.00	0.0	0.0	
<b>Phosphates</b>	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	
<b>Coals</b>	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	
<b>Clays</b>	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	
	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	
<b>Fluids</b>	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:	<p>Reference: Schlumberger 1990 Element Mineral Rock Catalog</p> <p>Muscovite and Biotite commonly decompose to form authigenic clays (i.e. chlorite).</p> <p>Micro porous clays associated with micas are Chlorite, Illite, Illite-Smectite, Glauconite-Smectite mixtures.</p> <p>Biotite is usually associated with Pyrite from the decomposition of this mica mineral with kaolinite and illite.</p> <p>Detrital heavy minerals of Zircon and Tourmaline are visible in clean reservoir sands.</p> <p>Feldspar dissolution develops micro/secondary porosity. Kaolin is formed during dissolution.</p> <p>Granitic trace minerals cause saturated GR responses: Zircon, Sphene</p> <p>Radioactive Isotopes: Potassium 40, Thorium 232, Uranium 238</p>										<p><b>Common Clastic Mineral Model - Marine / Fluvial</b></p> <p><b>Structural Grains</b></p> <ul style="list-style-type: none"> <li>Quartz</li> <li>Potassium Feldspar</li> </ul> <p><b>Structural &amp; Authigenic Clays</b></p> <ul style="list-style-type: none"> <li>Kaolinite</li> <li>Mixed layer Illite-Smectite</li> </ul> <p><b>Diagenetic Cements/Precipitates</b></p> <ul style="list-style-type: none"> <li>Dolomite</li> <li>Calcite</li> <li>Pyrite</li> <li>Siderite</li> </ul>			
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 (VirtualPPS)														