thermoscientific

Energy-Dispersive XRF

Excitation and Filter Guide

1 H HYDROGEN 1.008																	2 He HELIUM 4.003
3 Li LITHIUM 6.941	4 Be BERYLLIUM 9.012											5 B BORON 10.81	6 C CARBON 12.011	7 N NITROGEN 14.01	8 O OXYGEN 16.00	9 K K F FLUORINE 19.00 0.677 0.692	10 K K Ne NEON 20.18 0.851 0.878
11 K K Na SODIUM 22.99 1.041 1.080	12 K K Mg MAGNESIUM 24.31 1.254 1.303											13 K K Al ALUMINUM 26.98 1.487 1.559	14 K K Si SILICON 28.09 1.740 1.838 1.838	15 K K P PHOSPHORUS 30.97 2.015 2.142 2.142	16 K K S SULFUR 32.06 2.307 2.468 2.470	17 K K Cl CHLORINE 35.45 2.622 2.817 2.822	18 K K Ar ARGON 39.95 2.957 3.191 3.203
19 K K K POTASSIUM 39.10 3.312 3.589 3.607	20 K K Ca CALCIUM 40.08 3.690 4.012 4.038	21 K K Sc SCANDIUM 44.96 4.088 4.459 4.496	22 K K Ti TITANIUM 47.90 4.508 4.931 4.964	23 K K V VANADIUM 50.94 4.949 5.427 5.463	24 K K Cr CHROMIUM 52.00 5.411 5.947 5.988	25 K K Mn MANGANESE 54.94 5.895 6.492 6.537	26 K K Fe IRON 55.85 6.400 7.059 7.111	27 K K Co COBALT 58.93 6.925 7.649 7.709	28 K K Ni NICKEL 58.70 7.472 8.265 8.331	0.852 0.869 1.008	29 K K Cu COPPER 63.55 8.041 8.907 8.980	0.930 0.950 1.096	30 K K Zn ZINC 65.38 8.631 9.572 9.660	1.009 1.032 1.045	31 K K Ga GALLIUM 69.72 9.243 10.263 10.368	1.096 1.122 1.134	32 K K Ge GERMANIUM 72.59 9.876 10.984 11.103	1.186 1.216 1.248	33 K K As ARSENIC 74.92 10.532 11.729 11.863	1.282 1.317 1.473	34 K K Se SELENIUM 78.96 11.210 12.501 12.652	1.379 1.317 1.473	35 K K Br BROMINE 79.90 11.907 13.296 13.475	1.480 1.526 1.599	36 K K Kr KRYPTON 83.80 12.630 14.120 14.323	1.587 1.638 1.727
37 K K Rb RUBIDIUM 85.47 13.375 14.971 15.201	38 K K Sr STRONTIUM 87.62 14.142 15.849 16.106	1.694 1.752 1.866	39 K K Y YTTRIUM 88.91 14.933 16.754 17.037	1.806 1.872 2.008	40 K K Zr ZIRCONIUM 91.22 15.746 17.687 17.998	1.922 1.996 2.154	41 K K Nb NIOBIUM 92.91 16.746 18.647 18.987	2.042 2.124 2.305	42 K K Mo MOLYBDENUM 95.94 17.443 19.633 20.002	2.166 2.257 2.467	43 K K Tc TECHNETIUM (98) 18.327 20.647 21.054	2.293 2.395 2.627	44 K K Ru RUTHENIUM 101.07 19.236 21.687 22.118	2.424 2.538 2.795	45 K L Rh RHODIUM 102.91 20.167 22.759 23.224	2.558 2.683 2.996	46 K L Pd PALLADIUM 106.4 21.123 23.859 24.347	2.696 2.834 3.145	47 K L Ag SILVER 107.87 22.104 24.987 25.517	2.838 2.990 3.329	48 K L Cd CADMIUM 112.41 23.109 26.143 26.712	2.984 3.151 3.528	49 K L In INDIUM 114.82 24.139 27.382 27.928	3.133 3.316 3.727	50 K L Sn TIN 118.69 25.193 28.601 29.190	3.287 3.487 3.939	51 K L Sb ANTIMONY 121.75 26.274 29.851 30.486	3.444 3.662 4.157	52 K L Te TELLURIUM 127.6 27.380 31.128 31.809	3.605 3.843 4.381	53 K L I IODINE 126.90 28.512 32.437 33.164	3.769 4.029 4.613	54 K L Xe XENON 131.3 29.669 33.777 34.579	3.937 4.22 4.856	4.111 4.422 5.104
55 K L Cs CESIUM 132.91 30.854 35.149 35.959	4.286 4.620 5.358	56 K L Ba BARIUM 137.33 32.065 36.553 37.410	4.467 4.828 5.623	L	72 L L Hf HAFNIUM 178.49 55.382 63.562 65.313	7.898 9.021 10.734	73 L L Ta TANTALUM 180.95 57.106 65.556 67.400	8.145 9.341 11.130	74 L L W TUNGSTEN 183.85 58.864 67.586 69.508	8.396 9.670 11.535	75 L L Re RHENIUM 186.21 60.655 69.659 71.662	8.651 10.008 11.955	76 L L Os OSMIUM 190.2 62.482 71.775 73.860	8.910 10.354 12.383	77 L L Ir IRIDIUM 192.22 64.346 73.933 76.097	9.173 10.706 12.819	78 L L Pt PLATINUM 195.09 66.246 76.131 78.379	9.441 11.069 13.268	79 L L Au GOLD 198.97 68.185 78.372 80.713	9.711 11.439 13.733	80 L L Hg MERCURY 200.59 70.160 80.656 83.106	9.987 11.823 14.212	81 L L Tl THALLIUM 204.37 72.176 82.985 85.517	10.266 12.210 14.697	82 L L Pb LEAD 207.2 74.228 85.357 88.001	10.549 12.611 15.207	83 L L Bi BISMUTH 208.98 76.321 87.774 90.521	10.836 13.021 15.716	84 L L Po POLONIUM (209) 78.460 90.243 93.112	11.128 13.441 16.244	85 L L At ASTATINE (210) 80.636 92.754 95.740	11.424 13.873 16.784	86 L L Rn RADON (222) 82.855 95.315 98.418	11.724 14.316 17.337
87 L L Fr FRANCIUM (223) 85.124 97.930 101.147	12.029 14.770 17.904	88 L L Ra RADIUM 226.03 87.437 100.593 103.927	12.338 15.223 18.481	A	57 L L La LANTHANUM 138.91 33.302 37.986 38.931	4.651 5.043 5.894	58 L L Ce CERIUM 140.12 34.569 39.453 40.449	4.840 5.262 6.165	59 L L Pr PRASEODYMIUM 140.91 35.864 40.953 41.998	5.034 5.489 6.443	60 L L Nd NEODYMIUM 144.24 37.185 42.484 43.571	5.230 5.722 6.727	61 L L Pm PROMETHIUM (145) 38.535 44.049 45.207	5.431 5.956 7.018	62 L L Sm SAMARIUM 150.4 39.914 45.649 46.847	5.836 6.206 7.281	63 L L Eu EUROPIUM 151.96 41.323 47.283 48.515	5.846 6.456 7.624	64 L L Gd GADOLINIUM 157.25 42.761 48.949 50.229	6.059 6.714 7.940	65 L L Tb TERBIUM 158.93 44.229 50.650 51.998	6.275 6.979 8.258	66 L L Dy DYSPROSIUM 162.5 45.728 52.384 53.789	6.495 7.249 8.621	67 L L Ho HOLMIUM 164.93 47.257 54.155 55.615	6.720 7.528 8.920	68 L L Er ERBIUM 167.26 48.818 55.963 57.483	6.948 7.810 9.263	69 L L Tm THULIUM 168.93 50.410 57.806 59.335	7.181 8.103 9.628	70 L L Yb YTTERBIUM 173.04 52.035 59.687 61.303	7.414 8.401 9.977	71 L L Lu LUTETIUM 174.96 53.693 61.607 63.304	7.654 8.708 10.345
					89 L L Ac ACTINIUM (227) 89.790 103.31 106.76	12.650 15.712 19.078	90 L L Th THORIUM 232.04 92.19 106.08 109.63	12.966 16.200 19.688	91 L L Pa PROTACTINIUM 231.04 94.64 108.91 112.58	13.291 16.700 20.311	92 L L U URANIUM 238.03 97.14 111.79 115.59	13.613 17.218 20.943	93 L L Np NEPTUNIUM 237.05 99.693 114.72 118.62	13.945 17.740 21.596	94 L L Pu PLUTONIUM (244) 102.30 117.72 121.72	14.279 18.278 22.262	95 L L Am AMERICIUM (243) 104.95 120.78 124.88	14.618 18.829 22.944	96 Cm CURIUM (247)	97 Bk BERKELIUM (247)	98 Cf CALIFORNIUM (251)	99 Es EINSTEINIUM (254)	100 Fm FERMIUM (257)	101 Md MENDELEVIUM (258)	102 No NOBELIUM (259)	103 Lr LAWRENCIUM (260)	

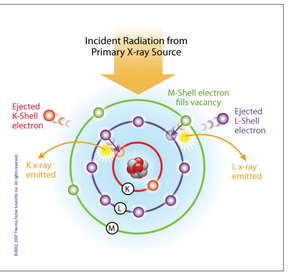
ATOMIC NUMBER — 47 K L — OPTIMIZED FILTER / ALTERNATE FILTER
Symbol
ELEMENT NAME
107.87 — ATOMIC WEIGHT
Kα wtd. avg. (keV) 22.104 2.984 Lα1 (keV)
Kβ wtd. avg. (keV) 24.987 3.151 Lβ1 (keV)
K abs. edge (keV) 25.517 3.528 LII abs. edge (keV)

Color Code	Condition Name	Filter Number	Default kV	Optimized Atmosphere
	Low Za	0	4	Vacuum (solids) / He (liquids)
	Low Za II	1	8	Vacuum (solids) / He (liquids)
	Low Zb	2	8	Vacuum (solids) / He (liquids)
	Low Zc	3	12	Air
	Mid Za	4	16	Air
	Mid Zb	5	20	Air
	Mid Zc	6	28	Air
	High Za	7	40	Air
	High Zb	8	50	Air

1. An incoming X-ray knocks out an electron from one of the orbitals surrounding the nucleus.

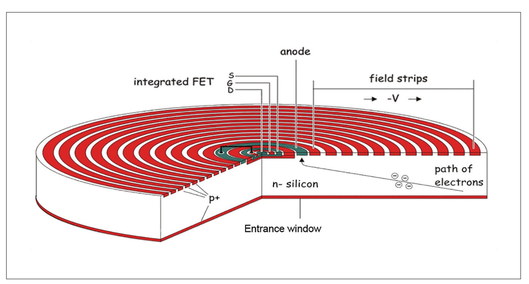
2. A hole is produced in the orbital leaving an unstable, high-energy atom.

3. To regain equilibrium, an electron from an outer orbital fills the hole. The excess energy is emitted as a fluorescent X-ray.

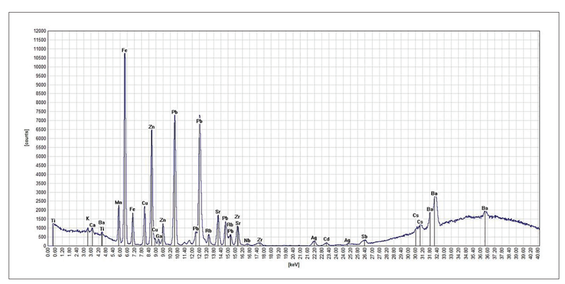


Principle of X-ray fluorescence

Different components of the EDXRF spectrometer



Detection principle of the silicon drift detector (SDD)



EDXRF detection of hazardous elements in NIST SRM 2710 Montana soil

Find out more at **thermofisher.com/XRF**

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