

## Limites de détection

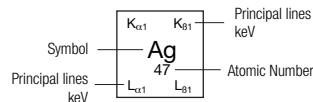
| Low-Density Sample Types — (soils, powders, liquids) |                   |                   |                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
|--|-------------------|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| Not Available  |                   | <3000 ppm         |                    | <400 ppm          |                   | <50 ppm           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| <25 ppm  |                   | <10 ppm           |                    | <5 ppm            |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| H<br>1   | IIA               |                   |                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  | He<br>2           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| 0.05<br>Li<br>3                                      | 0.11<br>Be<br>4   |                   |                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   | 0.18<br>B<br>5    | 0.28<br>C<br>6    | 0.39<br>N<br>7    | 0.52<br>O<br>8    | 0.68<br>F<br>9    | 0.85<br>Ne<br>10  |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| 1.04<br>Na<br>11                                     | 1.07<br>Mg<br>12  |                   |                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   | 1.49<br>Al<br>13  | 1.56<br>Si<br>14  | 1.74<br>P<br>15   | 1.84<br>S<br>16   | 2.01<br>Cl<br>17  | 2.14<br>Ar<br>18  | 2.31<br>Kr<br>36  | 2.46<br>Br<br>35  | 2.62<br>Xe<br>54  | 2.82<br>I<br>53   | 2.96<br>Rn<br>86  | 3.19<br>Fr<br>87  |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| IIIB   |                   | IVB               |                    | VB                |                   | VIB               |                   | VIIB              |                   | Group VIII        |                   | IB                |                   | IIB               |                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |
| 3.31<br>K<br>19                                      | 3.59<br>Ca<br>20  | 3.69<br>Sc<br>21  | 4.01<br>Ti<br>22   | 4.09<br>V<br>23   | 4.46<br>Cr<br>24  | 4.51<br>Mn<br>25  | 4.93<br>Fe<br>26  | 4.95<br>Co<br>27  | 5.43<br>Ni<br>28  | 5.41<br>Cu<br>29  | 5.95<br>Zn<br>30  | 5.9<br>Ga<br>31   | 6.49<br>Ge<br>32  | 6.4<br>As<br>33   | 6.93<br>Se<br>34  | 7.65<br>Br<br>35 | 7.48<br>Kr<br>36  | 8.26<br>Rb<br>37  | 8.05<br>Sr<br>38  | 8.91<br>Y<br>39   | 8.64<br>Zr<br>40  | 9.57<br>Nb<br>41  | 9.25<br>Mo<br>42  | 10.26<br>Tc<br>43 | 9.89<br>Ru<br>44  | 10.98<br>Rh<br>45 | 10.54<br>Pd<br>46 | 11.73<br>Ag<br>47 | 11.22<br>Cd<br>48 | 12.5<br>In<br>49  | 12.5<br>Sn<br>50   | 11.92<br>Sb<br>51  | 13.29<br>Te<br>52  | 13.29<br>I<br>53  | 12.65<br>Xe<br>54 | 14.11<br>Fr<br>87 | 1.64<br>Ra<br>88  |                  |
| 13.4<br>Rb<br>37                                     | 14.96<br>Sr<br>38 | 14.17<br>Y<br>39  | 15.84<br>Zr<br>40  | 14.96<br>Nb<br>41 | 16.74<br>Mo<br>42 | 15.78<br>Tc<br>43 | 17.67<br>Ru<br>44 | 16.62<br>Rh<br>45 | 18.62<br>Pd<br>46 | 17.48<br>Ag<br>47 | 19.61<br>Cd<br>48 | 18.37<br>In<br>49 | 20.62<br>Sn<br>50 | 19.28<br>Sb<br>51 | 21.66<br>Te<br>52 | 20.22<br>I<br>53 | 22.72<br>Xe<br>54 | 21.18<br>Fr<br>87 | 23.82<br>Ra<br>88 | 22.16<br>Ac<br>89 | 24.94<br>Th<br>90 | 23.17<br>Pa<br>91 | 26.1<br>U<br>92   | 24.21<br>Np<br>93 | 27.28<br>Pu<br>94 | 25.27<br>Am<br>95 | 28.49<br>Cm<br>96 | 26.36<br>Bk<br>97 | 29.73<br>Cf<br>98 | 27.47<br>Es<br>99 | 31<br>Fm<br>100    | 31<br>Md<br>101    | 37.7<br>No<br>102  | 4.03<br>Lr<br>103 | 3.94<br>Fr<br>87  | 4.22<br>Ra<br>88  | 4.11<br>Ac<br>89  | 4.42<br>Th<br>90 |
| 30.97<br>Cs<br>55                                    | 34.99<br>Ba<br>56 | 32.19<br>Hf<br>72 | 36.38<br>Ta<br>73  | 55.79<br>W<br>74  | 63.23<br>Re<br>75 | 57.53<br>Os<br>76 | 65.22<br>Ir<br>77 | 59.32<br>Pt<br>78 | 67.24<br>Au<br>79 | 61.14<br>Hg<br>80 | 69.31<br>Tl<br>81 | 71.41<br>Pb<br>82 | 73.56<br>Bi<br>83 | 66.83<br>Po<br>84 | 75.75<br>At<br>85 | 68.8<br>Rn<br>86 | 77.98<br>Fr<br>87 | 70.82<br>Ra<br>88 | 80.25<br>Ac<br>89 | 72.87<br>Th<br>90 | 82.58<br>Pa<br>91 | 74.97<br>U<br>92  | 84.94<br>Np<br>93 | 77.11<br>Pu<br>94 | 87.34<br>Am<br>95 | 79.29<br>Cm<br>96 | 89.8<br>Bk<br>97  | 81.52<br>Cf<br>98 | 89.8<br>Es<br>99  | 92.3<br>Fm<br>100 | 83.78<br>Md<br>101 | 94.87<br>No<br>102 | 83.78<br>Lr<br>103 | 94.87<br>Fr<br>87 | 94.87<br>Ra<br>88 | 94.87<br>Ac<br>89 | 94.87<br>Th<br>90 |                  |
| 86.1<br>Fr<br>87                                     | 97.47<br>Ra<br>88 | 88.47<br>Ac<br>89 | 100.13<br>Th<br>90 | 12.03<br>Pa<br>91 | 14.77<br>U<br>92  | 12.34<br>Np<br>93 | 15.24<br>Pu<br>94 |                   |                   |                   |                   |                   |                   |                   |                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                    |                    |                    |                   |                   |                   |                   |                  |

Lanthanides  
57-71

|                   |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                |      |      |      |     |      |      |      |      |      |      |     |      |     |      |      |
|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------|------|------|------|-----|------|------|------|------|------|------|-----|------|-----|------|------|
| 33.44<br>La<br>57 | 37.8<br>Ce<br>58 | 34.72<br>Pr<br>59 | 39.26<br>Nd<br>60 | 36.03<br>Pm<br>61 | 40.75<br>Sm<br>62 | 37.36<br>Eu<br>63 | 42.27<br>Gd<br>64 | 38.72<br>Tb<br>65 | 43.83<br>Dy<br>66 | 40.12<br>Ho<br>67 | 45.41<br>Er<br>68 | 41.54<br>Tm<br>69 | 47.04<br>Yb<br>70 | 43<br>Lu<br>71 |      |      |      |     |      |      |      |      |      |      |     |      |     |      |      |
| 4.65              | 5.04             | 4.84              | 5.26              | 5.03              | 5.49              | 5.23              | 5.72              | 5.43              | 5.96              | 5.64              | 6.21              | 5.85              | 6.46              | 6.06           | 6.71 | 6.27 | 6.98 | 6.5 | 7.25 | 6.72 | 7.53 | 6.95 | 7.81 | 7.18 | 8.1 | 7.42 | 8.4 | 7.66 | 8.71 |

Actinides  
89-103

|                   |                    |                   |                   |                   |                    |                   |                   |                    |                    |                    |                     |                     |                     |                     |                    |                    |                    |                    |                    |                   |                    |                    |                    |                    |                    |                    |                    |                     |                     |                     |                     |
|-------------------|--------------------|-------------------|-------------------|-------------------|--------------------|-------------------|-------------------|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| 90.88<br>Ac<br>89 | 102.85<br>Th<br>90 | 93.35<br>Pa<br>91 | 105.61<br>U<br>92 | 95.87<br>Np<br>93 | 108.43<br>Pu<br>94 | 98.44<br>Am<br>95 | 111.3<br>Cm<br>96 | 101.00<br>Bk<br>97 | 114.18<br>Cf<br>98 | 103.65<br>Es<br>99 | 117.15<br>Fm<br>100 | 106.35<br>Md<br>101 | 120.16<br>No<br>102 | 109.10<br>Lr<br>103 | 123.24<br>Fr<br>87 | 111.90<br>Ra<br>88 | 126.36<br>Ac<br>89 | 109.10<br>Th<br>90 | 129.54<br>Pa<br>91 | 114.75<br>U<br>92 | 132.78<br>Np<br>93 | 120.60<br>Pu<br>94 | 136.08<br>Am<br>95 | 120.60<br>Cm<br>96 | 136.08<br>Bk<br>97 | 120.60<br>Cf<br>98 | 136.08<br>Es<br>99 | 120.60<br>Fm<br>100 | 136.08<br>Md<br>101 | 120.60<br>No<br>102 | 136.08<br>Lr<br>103 |
| 12.65             | 15.71              | 12.97             | 16.2              | 13.29             | 16.7               | 13.61             | 17.22             | 13.95              | 17.74              | 14.28              | 18.28               | 14.62               | 18.83               | 14.96               | 19.39              | 15.31              | 19.97              | 15.66              | 20.56              | 16.02             | 21.17              | 16.38              | 21.79              | 16.38              | 21.79              | 16.38              | 21.79              | 16.38               | 21.79               | 16.38               | 21.79               |



Pour obtenir les limites de détection liées aux alliages, veuillez consulter les spécifications distinctes des limites de détection associées aux analyses d'alliages.

Les limites de détection dépendent de la durée d'analyse, de la matrice de l'échantillon et de l'absence ou de la présence d'éléments interférents. Les limites de détection sont des estimations calculées sur la base de durées d'analyse de 2 minutes, avec un niveau de confiance de détection de 3σ (intervalle de confiance à 99,7 %). Les limites de détection sans interférence sont fournies à titre indicatif : veuillez contacter Evident pour discuter de votre application spécifique. Les limites de détection des éléments de terres rares (ETR) sont calculées à l'aide de raies L en l'absence d'éléments de transition. « Vanta » est une marque de commerce d'Evident Corporation ou de ses filiales.

**PHOTON ENERGIES, IN ELECTRON VOLTS, OF PRINCIPAL K- AND L-SHELL EMISSION LINES**

| Element    | Symbol | Atomic # | K <sub>α1</sub> | K <sub>β1</sub> | L <sub>α1</sub> | L <sub>β1</sub> |
|------------|--------|----------|-----------------|-----------------|-----------------|-----------------|
| Actinium   | Ac     | 89       | 90.88           | 102.85          | 12.65           | 15.71           |
| Aluminum   | Al     | 13       | 1.49            | 1.56            | 0               | 0               |
| Antimony   | Sb     | 51       | 26.36           | 29.73           | 3.6             | 3.84            |
| Argon      | Ar     | 18       | 2.96            | 3.19            | 0               | 0               |
| Arsenic    | As     | 33       | 10.54           | 11.73           | 1.28            | 1.32            |
| Astatine   | At     | 85       | 81.52           | 92.3            | 11.43           | 13.88           |
| Barium     | Ba     | 56       | 32.19           | 36.38           | 4.47            | 4.83            |
| Beryllium  | Be     | 4        | 0.11            | 0               | 0               | 0               |
| Bismuth    | Bi     | 83       | 77.11           | 87.34           | 10.84           | 13.02           |
| Boron      | B      | 5        | 0.18            | 0               | 0               | 0               |
| Bromine    | Br     | 35       | 11.92           | 13.29           | 1.48            | 1.53            |
| Cadmium    | Cd     | 48       | 23.17           | 26.1            | 3.13            | 3.32            |
| Calcium    | Ca     | 20       | 3.69            | 4.01            | 0.34            | 0.34            |
| Carbon     | C      | 6        | 0.28            | 0               | 0               | 0               |
| Cerium     | Ce     | 58       | 34.72           | 39.26           | 4.84            | 5.26            |
| Cesium     | Cs     | 55       | 30.97           | 34.99           | 4.29            | 4.62            |
| Chlorine   | Cl     | 17       | 2.62            | 2.82            | 0               | 0               |
| Chromium   | Cr     | 24       | 5.41            | 5.95            | 0.57            | 0.58            |
| Cobalt     | Co     | 27       | 6.93            | 7.65            | 0.78            | 0.79            |
| Copper     | Cu     | 29       | 8.05            | 8.91            | 0.93            | 0.95            |
| Dysprosium | Dy     | 66       | 46              | 52.12           | 6.5             | 7.25            |
| Erbium     | Er     | 68       | 49.13           | 55.68           | 6.95            | 7.81            |
| Europium   | Eu     | 63       | 41.54           | 47.04           | 5.85            | 6.46            |
| Fluorine   | F      | 9        | 0.68            | 0               | 0               | 0               |
| Francium   | Fr     | 87       | 86.1            | 97.47           | 12.03           | 14.77           |
| Gadolinium | Gd     | 64       | 43              | 48.7            | 6.06            | 6.71            |
| Gallium    | Ga     | 31       | 9.25            | 10.26           | 1.1             | 1.12            |
| Germanium  | Ge     | 32       | 9.89            | 10.98           | 1.19            | 1.22            |
| Gold       | Au     | 79       | 68.8            | 77.98           | 9.71            | 11.44           |
| Hafnium    | Hf     | 72       | 55.79           | 63.23           | 7.9             | 9.02            |
| Holmium    | Ho     | 67       | 47.55           | 53.88           | 6.72            | 7.53            |
| Indium     | In     | 49       | 24.21           | 27.28           | 3.29            | 3.49            |
| Iodine     | I      | 53       | 28.61           | 32.29           | 3.94            | 4.22            |
| Iridium    | Ir     | 77       | 64.9            | 73.56           | 9.18            | 10.71           |
| Iron       | Fe     | 26       | 6.4             | 7.06            | 0.71            | 0.72            |
| Krypton    | Kr     | 36       | 12.65           | 14.11           | 1.59            | 1.64            |
| Lanthanum  | La     | 57       | 33.44           | 37.8            | 4.65            | 5.04            |
| Lead       | Pb     | 82       | 74.97           | 84.94           | 10.55           | 12.61           |
| Lithium    | Li     | 3        | 0.05            | 0               | 0               | 0               |
| Lutetium   | Lu     | 71       | 54.07           | 61.28           | 7.66            | 8.71            |
| Magnesium  | Mg     | 12       | 1.25            | 1.3             | 0               | 0               |
| Manganese  | Mn     | 25       | 5.9             | 6.49            | 0.64            | 0.65            |
| Mercury    | Hg     | 80       | 70.82           | 80.25           | 9.99            | 11.82           |
| Molybdenum | Mo     | 42       | 17.48           | 19.61           | 2.29            | 2.39            |
| Neodymium  | Nd     | 60       | 37.36           | 42.27           | 5.23            | 5.72            |

| Element      | Symbol | Atomic # | K <sub>α1</sub> | K <sub>β1</sub> | L <sub>α1</sub> | L <sub>β1</sub> |
|--------------|--------|----------|-----------------|-----------------|-----------------|-----------------|
| Neon         | Ne     | 10       | 0.85            | 0               | 0               | 0               |
| Nickel       | Ni     | 28       | 7.48            | 8.26            | 0.85            | 0.87            |
| Niobium      | Nb     | 41       | 16.62           | 18.62           | 2.17            | 2.26            |
| Nitrogen     | N      | 7        | 0.39            | 0               | 0               | 0               |
| Osmium       | Os     | 76       | 63              | 71.41           | 8.91            | 10.36           |
| Oxygen       | O      | 8        | 0.52            | 0               | 0               | 0               |
| Palladium    | Pd     | 46       | 21.18           | 23.82           | 2.84            | 2.99            |
| Phosphorus   | P      | 15       | 2.01            | 2.14            | 0               | 0               |
| Platinum     | Pt     | 78       | 66.83           | 75.75           | 9.44            | 11.07           |
| Polonium     | Po     | 84       | 79.29           | 89.8            | 11.13           | 13.45           |
| Potassium    | K      | 19       | 3.31            | 3.59            | 0               | 0               |
| Praseodymium | Pr     | 59       | 36.03           | 40.75           | 5.03            | 5.49            |
| Promethium   | Pm     | 61       | 38.72           | 43.83           | 5.43            | 5.96            |
| Protactinium | Pa     | 91       | 95.87           | 108.43          | 13.29           | 16.7            |
| Radium       | Ra     | 88       | 88.47           | 100.13          | 12.34           | 15.24           |
| Radon        | Rn     | 86       | 83.78           | 94.87           | 11.73           | 14.32           |
| Rhenium      | Re     | 75       | 61.14           | 69.31           | 8.65            | 10.01           |
| Rhodium      | Rh     | 45       | 20.22           | 22.72           | 2.7             | 2.83            |
| Rubidium     | Rb     | 37       | 13.4            | 14.96           | 1.69            | 1.75            |
| Ruthenium    | Ru     | 44       | 19.28           | 21.66           | 2.56            | 2.68            |
| Samarium     | Sm     | 62       | 40.12           | 45.41           | 5.64            | 6.21            |
| Scandium     | Sc     | 21       | 4.09            | 4.46            | 0.4             | 0.4             |
| Selenium     | Se     | 34       | 11.22           | 12.5            | 1.38            | 1.42            |
| Silicon      | Si     | 14       | 1.74            | 1.84            | 0               | 0               |
| Silver       | Ag     | 47       | 22.16           | 24.94           | 2.98            | 3.15            |
| Sodium       | Na     | 11       | 1.04            | 1.07            | 0               | 0               |
| Strontium    | Sr     | 38       | 14.17           | 15.84           | 1.81            | 1.87            |
| Sulfur       | S      | 16       | 2.31            | 2.46            | 0               | 0               |
| Tantalum     | Ta     | 73       | 57.53           | 65.22           | 8.15            | 9.34            |
| Technetium   | Tc     | 43       | 18.37           | 20.62           | 2.42            | 2.54            |
| Tellurium    | Te     | 52       | 27.47           | 31              | 3.77            | 4.03            |
| Terbium      | Tb     | 65       | 44.48           | 50.38           | 6.27            | 6.98            |
| Thallium     | Tl     | 81       | 72.87           | 82.58           | 10.27           | 12.21           |
| Thorium      | Th     | 90       | 93.35           | 105.61          | 12.97           | 16.2            |
| Thulium      | Tm     | 69       | 50.74           | 57.52           | 7.18            | 8.1             |
| Tin          | Sn     | 50       | 25.27           | 28.49           | 3.44            | 3.66            |
| Titanium     | Ti     | 22       | 4.51            | 4.93            | 0.45            | 0.46            |
| Tungsten     | W      | 74       | 59.32           | 67.24           | 8.4             | 9.67            |
| Uranium      | U      | 92       | 98.44           | 111.3           | 13.61           | 17.22           |
| Vanadium     | V      | 23       | 4.95            | 5.43            | 0.51            | 0.52            |
| Xenon        | Xe     | 54       | 29.78           | 33.62           | 4.11            | 4.42            |
| Ytterbium    | Yb     | 70       | 52.39           | 59.37           | 7.42            | 8.4             |
| Yttrium      | Y      | 39       | 14.96           | 16.74           | 1.92            | 2               |
| Zinc         | Zn     | 30       | 8.64            | 9.57            | 1.01            | 1.03            |
| Zirconium    | Zr     | 40       | 15.78           | 17.67           | 2.04            | 2.12            |