

Fluorine: The Element From Hell



By Josh Bloom — February 14, 2016

If I start this thing off with the periodic table, even my own mother won't read it, and she is one of the few people on Earth who can stand me.

So, I altered the table enough to make it more interesting. Note the fine artwork.

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|--------------------------------|------------------------------------|---------------------------------|--------------------------------------|-----------------------------------|---------------------------------|----------------------------------|----------------------------------|------------------------------------|---------------------------------|------------------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------------------|-------------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------|-----------------------------|--------------------------------|-----------------------------|
| hydrogen 1 H 1.0079 | | | | | | | | | | | | | | | | | helium 2 He 4.0026 | | | | | | |
| lithium 3 Li 6.941 | beryllium 4 Be 9.0122 | | | | | | | | | | | | | | | | | boron 5 B 10.811 | carbon 6 C 12.011 | nitrogen 7 N 14.007 | oxygen 8 O 15.999 | fluorine 9 F 18.998 | neon 10 Ne 20.180 |
| magnesium 12 Mg 24.305 | | | | | | | | | | | | | | | | | | aluminum 13 Al 26.982 | silicon 14 Si 28.086 | phosphorus 15 P 30.974 | sulfur 16 S 32.065 | chlorine 17 Cl 35.453 | argon 18 Ar 39.948 |
| potassium 19 K 39.098 | calcium 20 Ca 40.078 | scandium 21 Sc 44.956 | titanium 22 Ti 47.867 | vanadium 23 V 50.942 | chromium 24 Cr 51.996 | manganese 25 Mn 54.938 | iron 26 Fe 55.845 | cobalt 27 Co 58.933 | nickel 28 Ni 58.693 | copper 29 Cu 63.546 | zinc 30 Zn 65.39 | gallium 31 Ga 69.723 | germanium 32 Ge 72.61 | arsenic 33 As 74.922 | selenium 34 Se 78.96 | bromine 35 Br 79.904 | krypton 36 Kr 83.80 | | | | | | |
| rubidium 37 Rb 85.468 | strontium 38 Sr 87.62 | yttrium 39 Y 88.906 | zirconium 40 Zr 91.224 | niobium 41 Nb 92.906 | molybdenum 42 Mo 95.94 | technetium 43 Tc [98] | ruthenium 44 Ru 101.07 | rhodium 45 Rh 102.91 | palladium 46 Pd 106.42 | silver 47 Ag 107.87 | cadmium 48 Cd 112.41 | indium 49 In 114.82 | tin 50 Sn 118.71 | antimony 51 Sb 121.76 | tellurium 52 Te 127.60 | iodine 53 I 126.90 | xenon 54 Xe 131.29 | | | | | | |
| cesium 55 Cs 132.91 | barium 56 Ba 137.33 | lanthanum 57 La [138.905] | cerium 58 Ce [140.12] | praseodymium 59 Pr [140.91] | neodymium 60 Nd [144.24] | promethium 61 Pm [145] | samarium 62 Sm [150.36] | europium 63 Eu [151.96] | gadolinium 64 Gd [157.25] | terbium 65 Tb [158.93] | dysprosium 66 Dy [162.50] | holmium 67 Ho [164.93] | erbium 68 Er [167.26] | thulium 69 Tm [168.93] | ytterbium 70 Yb [173.04] | radon 86 Rn [222] | | | | | | | |
| francium 87 Fr [223] | radium 88 Ra [226] | actinium 89 Ac [227] | thorium 90 Th 232.04 | protactinium 91 Pa [231.04] | uranium 92 U 238.03 | neptunium 93 Np [237] | plutonium 94 Pu [244] | americium 95 Am [243] | curium 96 Cm [247] | berkelium 97 Bk [247] | californium 98 Cf [251] | einsteinium 99 Es [252] | fermium 100 Fm [257] | mendelevium 101 Md [258] | nobelium 102 No [259] | astatine 85 At [210] | | radon 86 Rn [222] | | | | | |

Josh's Psycho Periodic Table

It should be clear that some elements are far more interesting than others. Every chemist loves the "badass" elements. Because they blow up when you chuck them into water. Here (Watch the whole 30 seconds!):

<https://www.youtube.com/watch?v=sNdijknRxfU> [1]

Pretty cool, huh? As bad as cesium is, there is one element that is even worse: fluorine. It is the most reactive of all the elements, and most chemists will never see it, let alone use it. The precautions you must take just to handle the stuff are "mildly alarming."

There is a [publication](#) [2], which, ironically (I don't think they were kidding) is called "Working With HF [hydrofluoric acid] And Fluorine Safely." You go first.

- It reacts with virtually every element except Ar, He, and Ne.
- It is lethal at very low levels.

- Fire fighting The only practical way to extinguish a fluorine fire is to shut off the source of fluorine.
- Water and CO₂ fire extinguishers only add fuel to fire.
- F₂ is one of the most hazardous substances found in MSTD* laboratories.

* Materials Science and Technology Division, Oak Ridge National Laboratory



If that doesn't make you feel safe enough, [another booklet](#) [3] tells you how to protect yourself from it. Doesn't sound all that bad:

- Self-contained breathing apparatus with a full face piece
- Operated in the pressure demand mode or other positive pressure mode.

There is a fascinating (and entertaining) piece on the [LateralScience](#) [4] website, which describes what happened to some of the early chemistry pioneers who first isolated molecular fluorine (1). You just have to love the title "Fluorine the Gas of Lucifer." There is a message here. It is not subtle:

"This most reactive of the elements proved to be exceedingly difficult and dangerous to isolate. Fluorine chemists who were mauled by the tiger:

Humphrey Davy of England: poisoned, recovered.

George and Thomas Knox of Ireland: both poisoned, one bedridden 3 years, recovered.

P. Louyet of Belgium: poisoned, died.

Jerome Nickels of Nancy, France: poisoned, died.

George Gore of England: fluorine / hydrogen explosion, narrowly escaped injury.

Henri Moissan of France: poisoned several times, success, but shortened lifespan."

So, how bad is fluorine? See for yourself what some certified lunatics tried:

This guy burned a brick with it:

<https://www.youtube.com/watch?v=wqLnSkLaIOE> [5]

This guy (who looks like he just arrived from Pluto) sprays it on charcoal:

https://www.youtube.com/watch?v=-_7axQ7YAnE [6]

And, for reasons that only he can know, this knucklehead decided to try it out on a raw chicken:

https://www.youtube.com/watch?v=M5_9z1TxUfg [7]

Although he may be onto something:



(1) Note: Fluorine is NOT fluoride, just like chlorine, a WWI chemical weapon is not chloride (salt). Although fluoride is toxic at doses that are WAY higher than what is found in drinking water (apologies to fluoride conspiracy loonies) fluoride makes it seem like a baby rattle. It is so reactive that it exists nowhere on earth, with the exception of [miniscule traces](#) [8] that are trapped in a mineral called antozonite.

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Source URL: <https://www.acsh.org/news/2016/02/14/fluorine-element-hell>

Links

[1] <https://www.youtube.com/watch?v=sNdijknRxfU>

[2] http://web.ornl.gov/sci/psd/mst/rsg/pdf/HF_Safety_1.pdf

[3] http://web.ornl.gov/~webworks/cpr/rpt/106423_.pdf

[4] <http://www.lateralscience.co.uk/Fluorine/Fluorine.html>

[5] <https://www.youtube.com/watch?v=wqLnSkLalOE>

[6] https://www.youtube.com/watch?v=-_7axQ7YAnE

[7] https://www.youtube.com/watch?v=M5_9z1TxUfg

[8] <http://www.rsc.org/chemistryworld/2012/07/fluorine-finally-found-nature>