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Nuclear Reactions and X-Rays by Metals Combustion

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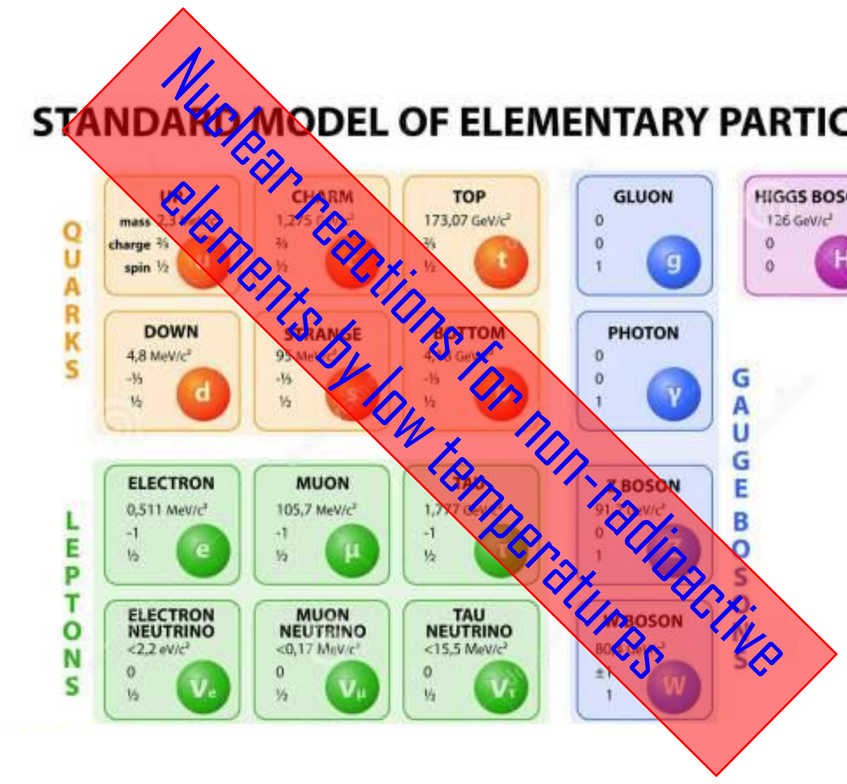


Al + Fe_2O_3 thermite burning on air (T>2500°C)

Conventional reaction

$Fe_2O_3 + 2\,Al \longrightarrow 2\,Fe + Al_2O_3$ (1)

But also:

-Chemical reaction of Al with N_2

$Al + ½\,N_2 \longrightarrow AlN + 319$ kJ (2)

- Nuclear reaction

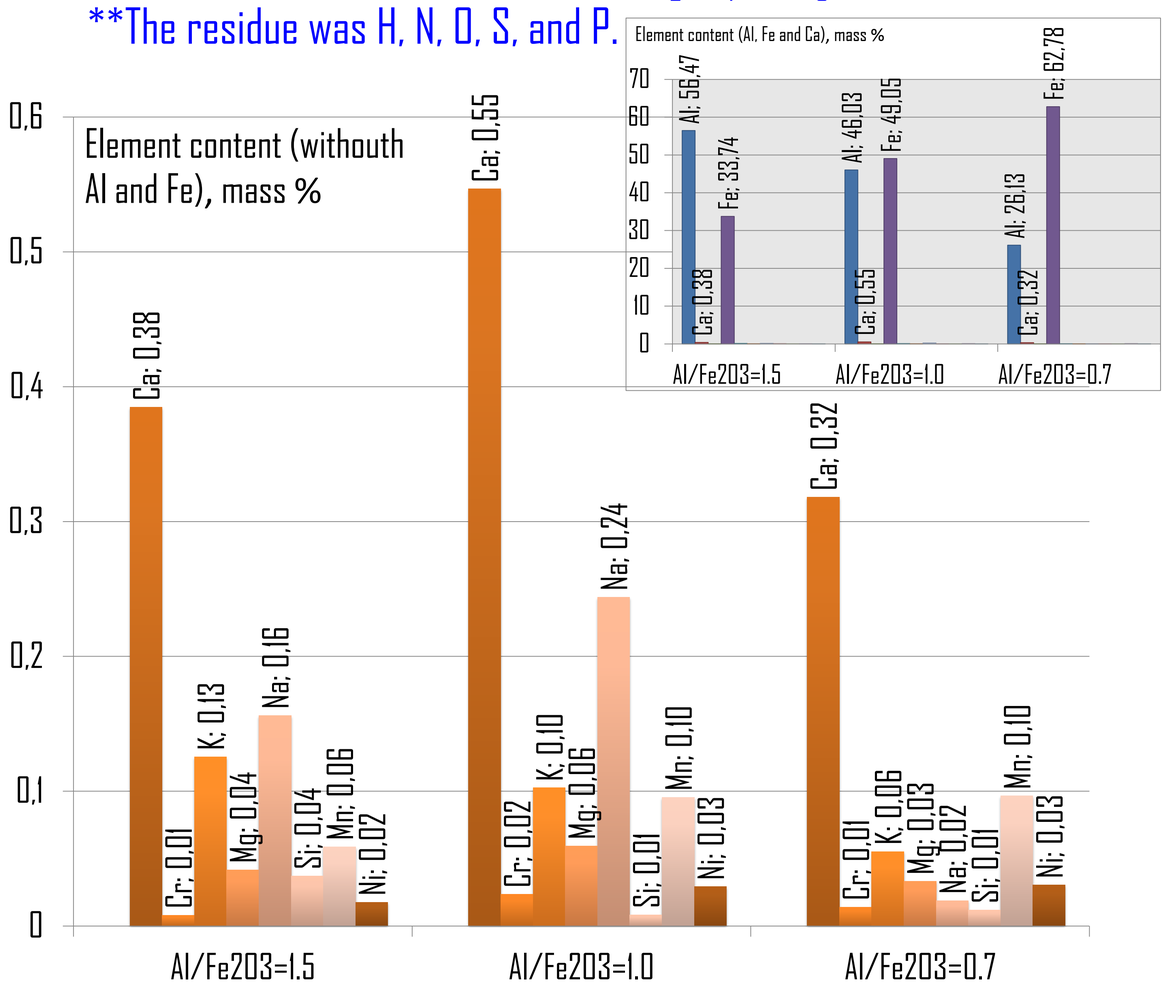
$Al^{13} + N^{7} \longrightarrow Ca^{20} + 8\times10^{10}$ kJ (3)

Table. Composition of reactants and combustion products of (Al + Fe_2O_3) thermite burned on air (ICP-MS and XRF data)

Reactants (1-3) and combustion products (4-6)	Metal content*, (mass % ± 0.01 mass %)										
	W	Fe	Al	Ca	Cr	K	Mg	Na	Si	Mn	Ni
1. W plates	99.95	<0.01	0.02	<0.01	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
2. Fe_2O_3**	<0.01	70.04	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
3. Al ASD-4**	<0.01	0.12	99.71	<0.01	0.03	0.02	0.01	<0.01	0.15	0.01	0.03
4. Al / Fe_2O_3 = 1.5**	<0.01	33.74	56.47	0.38	0.01	0.13	0.04	0.16	0.04	0.06	0.02
5. Al / Fe_2O_3 = 1.0**	<0.01	49.05	46.04	0.55	0.02	0.10	0.06	0.24	0.01	0.10	0.03
6. Al / Fe_2O_3 = 0.7**	<0.01	62.78	26.13	0.32	0.01	0.06	0.03	0.02	0.01	0.10	0.03

* Metal content in acids for analysis (H_2SO_4, HNO_3, HCl) and bi-distilled water was not more than 0.005 mass %.

**The residue was H, N, O, S, and P.



Results

1. Thermites and SHS combustion is accompanied by X-rays with the energy of several keV/atom.
2. Nuclear transmutation (Ca formation of huge amount up to 0.55 mass %) was found by using of extra-pure reagents (99.7-99.9 mass %)

Refs.

1. Gromov A.A. et al.
Formation of calcium in the products of iron–aluminum thermite combustion in air, *Russian Journal of Physical Chemistry A.*, 2016, 90 (10), 2104–2106.
2. Kirdyashkin A.I. et al.
X-ray radiation in self-propagating high-temperature synthesis processes, *Combust, Explos, Shock Waves*, 2008, 44 (6), 729–731.