Doppelgänger?

Martin Fleischmann Memorial Project

Bob W. Greenyer B. Eng. (Hons.)

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What if you had a document that…

- Showed nuclear synthesis without harmful radiation
- had two catalysts, a big and a small one
- could self sustain
- operated between 300 and 1500ºC +
- Had demonstrated melt-downs
- worked as a fluid
- could be enhanced by other catalysts
- potentially gave insight to the whole LENR field

Lugano ash

Table 1. Measured and natural occurring abundances for Li and Ni ions in fuel and ash, respectively.

Ion	Fuel		Ash		
	Counts in peak	Measured abundance [%]	Counts in peak	Measured abundance [%]	Natural abundance [%]
$^{6}Li^{+}$	15804	8.6	569302	92.1	7.5
$^{7}Li^{+}$	168919	91.4	48687	7.9	92.5
$^{58}Ni^{-}$	93392	67	1128	0.8	68.1
$^{60}Ni^{-}$	36690	26.3	635	0.5	26.2
$^{61}Ni^{-}$	2606	1.9	~0	0	1.8
$^{62}Ni^{-}$	5379	3.9	133272	98.7	3.6
$^{64}Ni^{-}$	1331	1	~0	0	0.9

- Major shifts in both nickel and lithium isotopes

Where is the main energy coming from?

Low Energy Nuclear reactions (LENR), candidates may be

Neutron stripping: $\mathbf{^{7}Li + {}^{A}Ni \rightarrow {}^{6}Li + {}^{A+1}Ni}$

(favoured by Gullström/Upsalla)

or

Fusion + Fission Decay: $\mathbf{p + {}^{7}Li \rightarrow {}^{8}Be \rightarrow {}^{4}He + {}^{4}He}$

(favoured by Piantelli and giving a yield of 17 MeV)

Patent US application 0263758A1

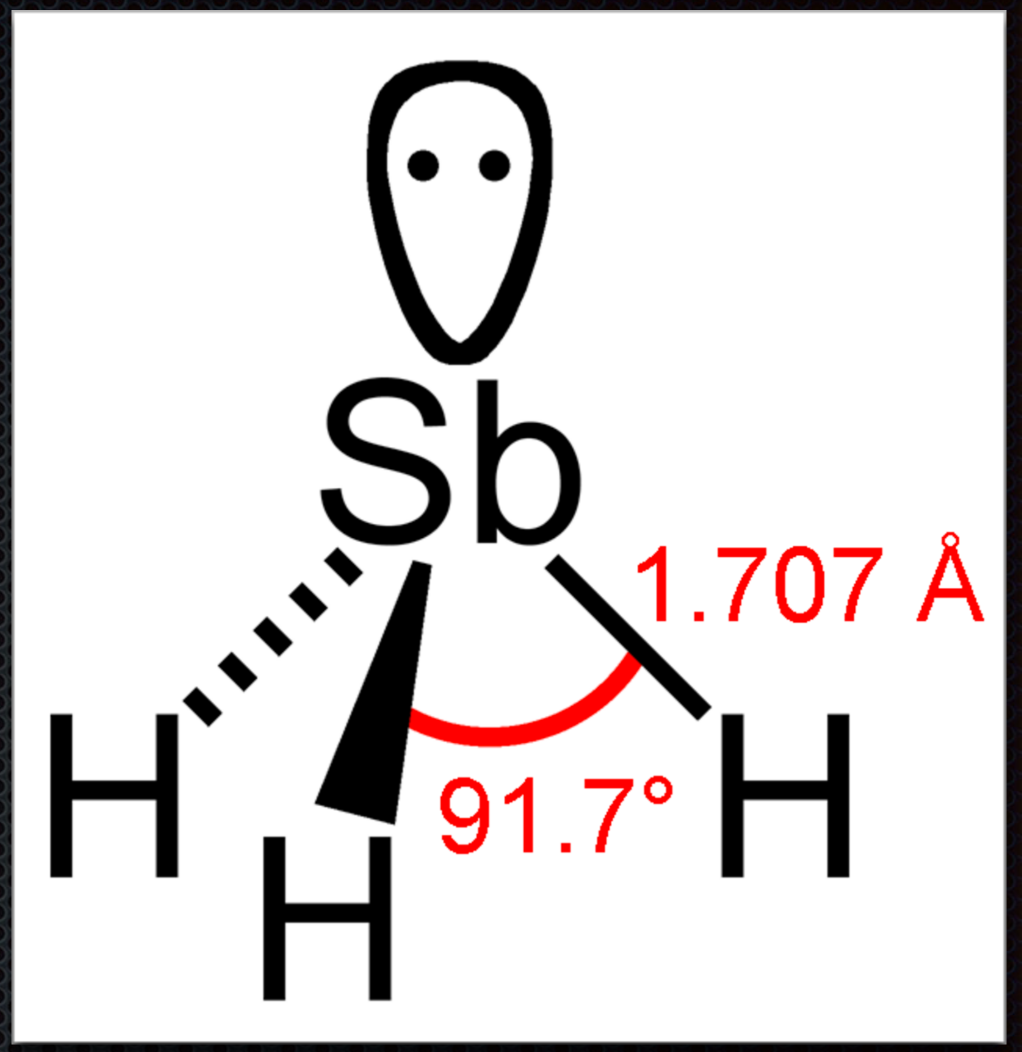
"A process is disclosed for the generation of energy achieved when an ionic hydride or deuteride is heated with certain elements capable of forming a covalent hydride or deuteride respectively"

(54) **DEUTERIDE/HYDRIDE CATALYZED CONDENSATION ENERGY PRODUCTION**

(76) Inventors: **Richard A. Day**, Crever, OH (US); **Kenneth A. Rubinson**, Bethesda, MD (US); **Terrence McConville**, Cincinnati, OH (US); **Alfred Kornel**, Cincinnati, OH (US)

- Priority date: May 3rd, 2006
- Published: November 15th, 2007
- Rossi's 1st public demo: January 14th, 2011

What is it about?

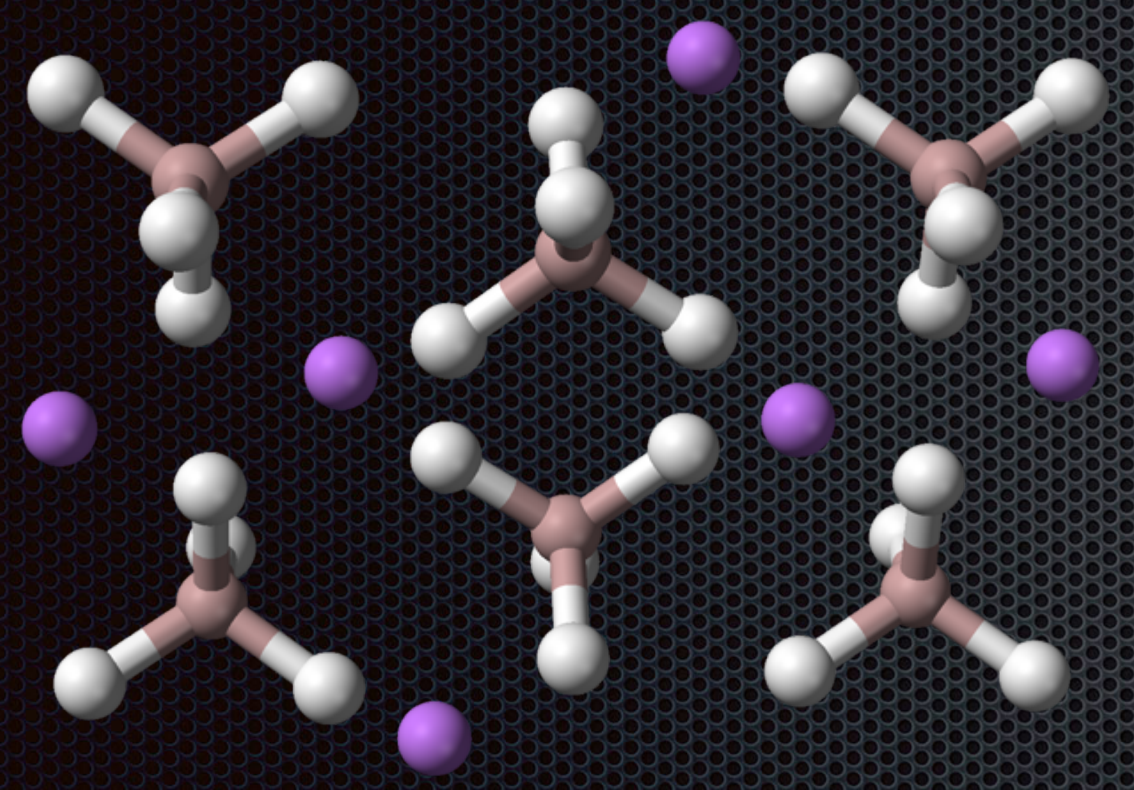


- Well, excess heat from LENR and something like Lithium and Lithium Aluminium Hydride would qualify… and as you will see, it is a good choice relatively from a safety standpoint
- The patents preferred embodiment is to use antimony which forms Stibine with protium which is a gas which is phenomenally toxic, but, it has short bond lengths and angles which can be excited into vibration modes by THz radiation (read IR). The hydrogen could be replaced by deuterium.
- Into the mix you place a molten ionic hydride like [Li+ H-] or [Na+ D-]
- The H-/D- causes a collapse of the hydrogen isotopes on the main catalyst and via a transition state, there is collective condensation leading to nuclear synthesis

Observation of pressure drops GS5.3

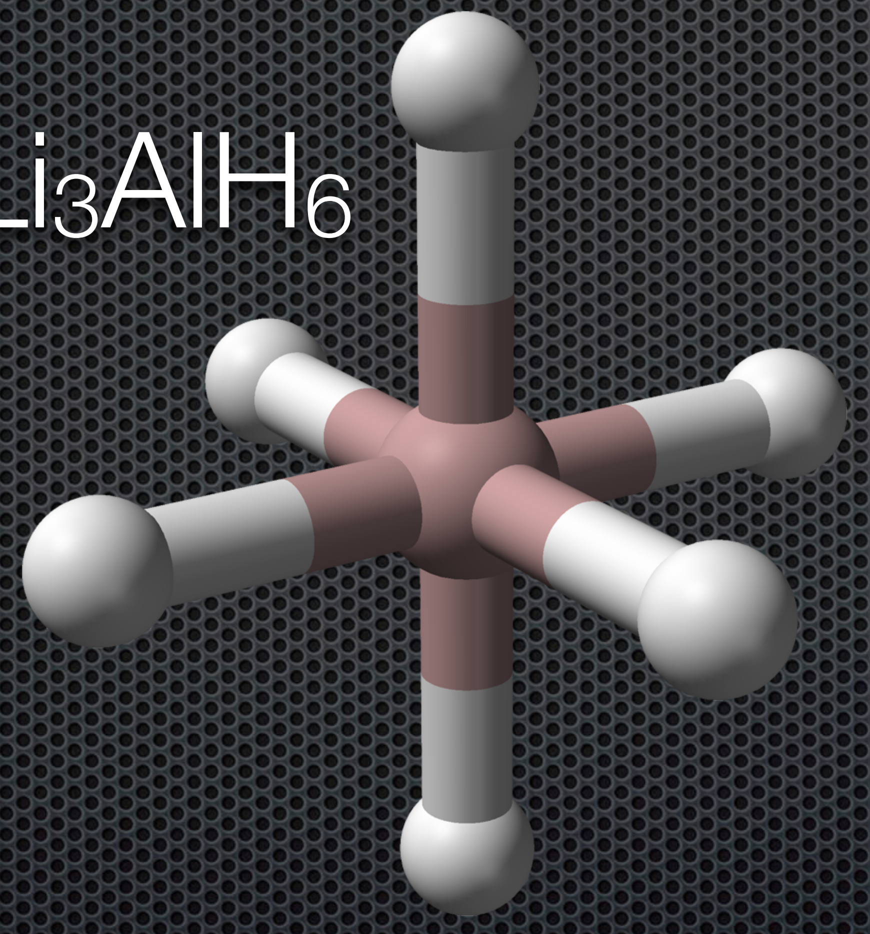
- During *Glow Stick* 5.3 we saw large reversible pressure drops repeatedly over a narrow temperature range where pressure was higher on either side
- Could this be Li_3AlH_6 and 2 x $^1H^-$ in an unstable intermediate state?

NOTE: THESE CAN BE HIGHLY TOXIC



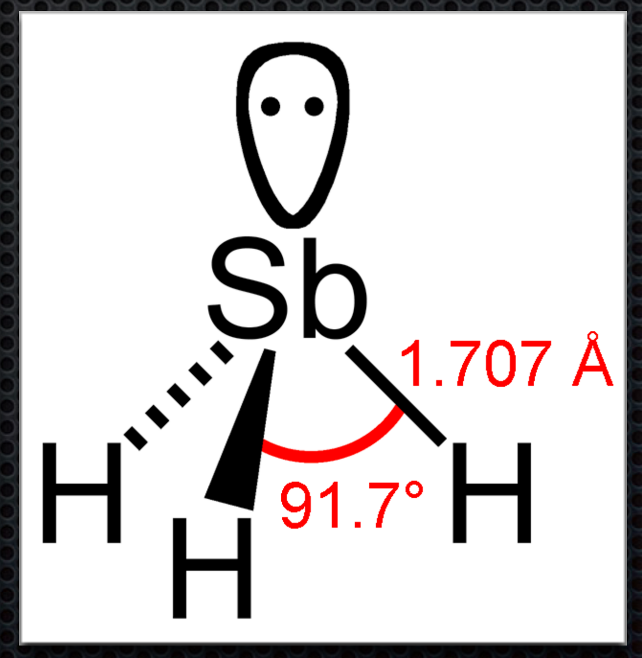
Al-H distances in $LiAlH_4$ vary between 1.59 and 1.64 Å

Li_3AlH_6



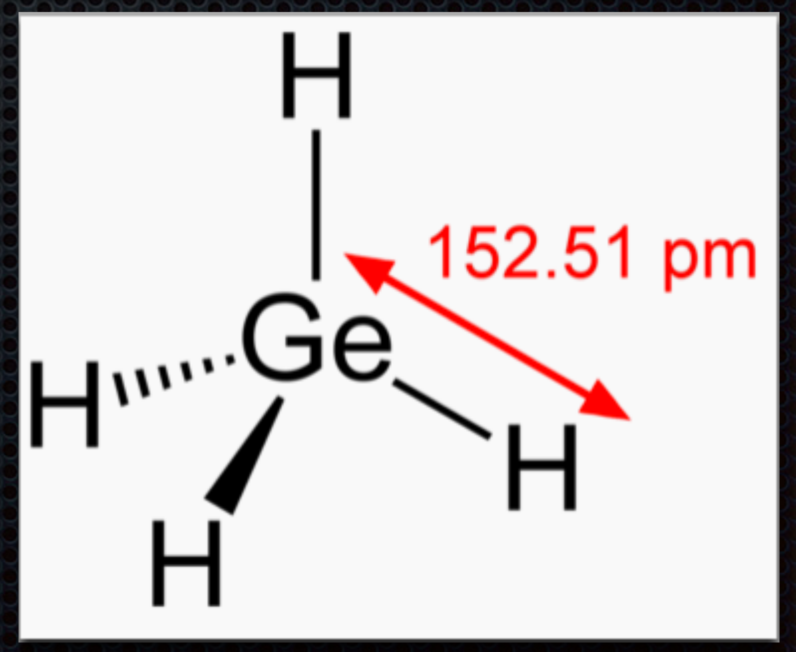
1.72 Å

Stibine



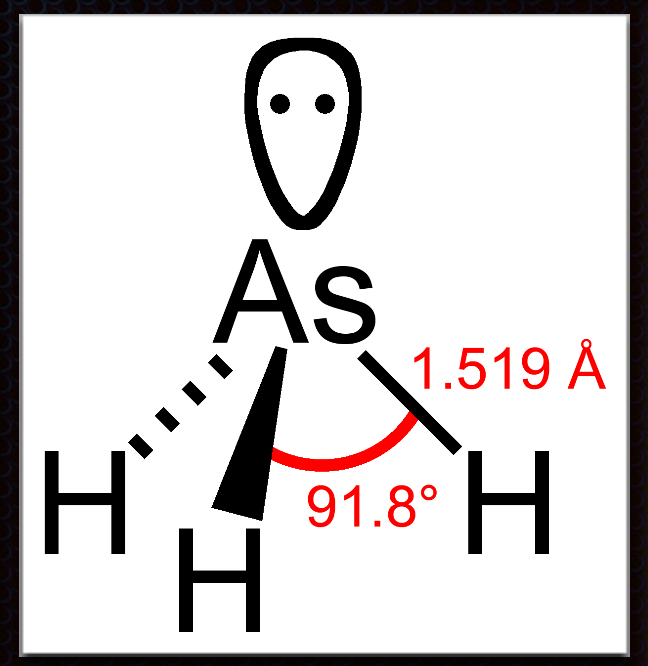
1.707 Å

Germane



1.525 Å

Arsine



1.519 Å

6Li/7Li ratio increase in Lugano?

- In respect of Deuterium and catalysts such as Antimony (Sb), the patent claims

  "With three deuteriums, ^{6}Li is the predominant product"

  so if the Lugano reactor was actually using $LiAlD_4$, ^{6}Li could be synthesised

- However, on page 28 of the Lugano report it says the fuel did not contain deuterium

> compatible with a $LiAlH_4$ molecule. This compound can be used to produce free hydrogen by heating. We remark in particular that hydrogen but no deuterium was seen by SIMS. The other methods are insensitive to both hydrogen and deuterium.

LiAlH4

- Li_3AlH_6 where any group of 3 x ^1H + H- leads to ^4H -which decays to ^3H + neutron, could this explain neutrons observed in *GlowStick* 5.3?
- neutrons could transmute nickel isotopes and other cell constituents, yielding range of elements and potential secondary reaction products
- neutrons could transmute 7Li to 8Li - decays to 2 Alphas and a beta-, whose high energy would be dissipated as Cherenkov radiation. Could this explain “Signal” in *GlowStick* 5.2? Would it explain the “Blue Glow” in claimed E-Cat X? Alternatively ^8Li to ^8Be which immediately becomes $2x^4He$
- However, patent 0263758A1 says no ^3H is observed

Why no ^3H?

- So is 4H becoming 4He?

2.1.1 Solar neutrinos

The Sun loses energy by radiation, but remains stable due to the production of energy via hydrogen burning. The main burning cycle in the Sun is called *pp-cycle* where hydrogen is fused to helium. The net reaction can be written as:

$$4\mathrm{H} + 2e^- \rightarrow {}^4\mathrm{He} + 2\nu_e + 26.73\,\mathrm{MeV}. \quad (2.1)$$

- So that would be 3 x ^1H + H- exactly as claimed in patent 0263758A1 and one might ask if it can provide an alternative explanation for the observations of Canon, Piantelli, Rossi, Brillouin, Clean Planet etc. and with deuterium, Pons and Fleischmann. Requires cleaning and pre-loading/occlusion saturation into confining geometries in other embodiments though

^{4}He interactions?

- ^{4}He / alpha, depending on energy could transmute:
  ^{58}Ni to ^{62}Ni by way short lived positron emitting ^{62}Zn and ^{62}Cu
  ^{60}Ni to ^{65}Cu ^{61}Ni to ^{65}Cu by way short lived positron emitting ^{65}Zn
  ^{62}Ni to ^{66}Zn ^{64}Ni to ^{68}Zn

- If only looking at Ni, then Nickel ^{62}Ni would be predominant isotope in ash

- However, on p. 29 of the Lugano report, the authors say stable zinc not found in ash which is unsurprising given the huge unlikelihood of ^{4}He and Nickel interactions

> exciting ^{58}Ni to ^{62}Zn, which then via positron emission decays back to ^{62}Cu and ^{62}Ni, but that is hardly believable to occur due to an enormous Coulomb barrier to merge ^{4}He and Ni. Besides, with this reaction one can also go to stable Zn isotopes, which are not found in the ash.

How can the Aluminium disappear?

Assuming these high energy ^4He

Reaction Q-values for ^{27}Al + alpha

$^{31}P+\gamma$	9668.71	Stable	R1
$^{30}Si+p$	2372.16	Stable	R2

Protons from R2 could interact with Nickel to result in observed ash transmutations and they could also interact with ^7Li to change that ratio

Empirical data in patent application

TABLE 1

Examples of correlation of observed heat production with Na, D_2, and Sb with theoretical heat of mass to energy conversion

EXPERIMENTS[a]	Amount ^6Li formed	Theoretical Joules $3d \rightarrow {}^6Li$[c]	Observed Joules
Procedure 1	21 ng-atoms	50,700	57,300
Procedure 2	36 ng-atoms	86,400	93,300
CONTROLS	ng-atoms		
Nitric acid reagent[b]	0.0025	—	—
Sodium[b]	0.0025	—	—
Residue	0.0022	—	—
Sb[c]	0.0156	—	—
Stainless steel[d]	0.0093	—	—

TABLE 2

Protium/Deuterium Conversion to ^3He and ^4He with Boron and Germanium Catalysts

Catalysts/Reactants	Products	Amount[a] of Product ng-atoms
$B/NaH/H_2$	^3He	0.15
	^4He	0.067
$Ge/NaH/H_2$	^3He	1.4
	^4He	0.56
$NaBD_4/D_2$	^3He	0.077
(B/D)	^4He	0.30
	^6Li	trace
	^7Li	trace

Lack of radiation?

[0017]

“No high energy radiation escapes the hermetically sealed cell during heat production **with deuterium fusion**, nor is any detectable amount of a radioactive product produced when the cell contents are examined.”

Meltdowns?

[0021]

"When germanium is used as a catalyst, **temperatures rapidly rise above the melting point of stainless steel (1450ºC)**. Thus, with Ge, reaction vessels need to be made of higher melting alloys to avoid container failure."

Self sustain?

[0034]

“If the cell and its contents are heated while maintaining elevated pressure, **the reaction will be self-sustaining.**”

“The reaction can then be controlled by use of heat exchangers which will maintain the temperature at acceptable levels, **generally below 1500° C and above 900-1000° C**. Thus, the reaction will be self-sustaining and the heat removed can be used as an energy source”

Adding heat

[0035]

"Alternately, at lower temperatures, where the reaction is not self-sustaining, i.e., below 900° C and above 300° C, a non-self-sustaining reaction will occur. Thus, the reaction chamber can be placed in a heated area, such as within a power plant, to boost energy output. The reaction chamber would simply be placed in proximity to the burners from the power plant, or other heat source from the power plant, so that the external temperature of the chamber exceeds 300° C, preferably about 650° C, causing the fusion reaction to occur and, in turn, increasing the energy output from the power plant."

Transition metal?

- At first glance, there appears to be no transition metal in this system
- However, all suggested reactors contain transition metals
- Testing a suggested embodiment in an Al_2O_3 *GlowStick* or similar would resolve this question

Fuel ratios?

- **Procedure 1 [0026]**
  "The molar ratio of hydride/deuteride salt to catalyst should be 10 to 1"
- **Procedure 2 [0027]**
  "The molar ratio of catalytic element [such as antimony] to reactive metal [preferred metal is sodium] to hydrogen/deuterium should be catalyst 0.01M, reactive metal 0.1M, hydrogen/deuterium 0 .001 to 0.002M"

LENR LIVE Proposal 3:
Go for melt down?

PROCEED WITH EXTREME CAUTION
ONLY CONSIDER THIS IF YOU ARE COMPETENT, HAVE A REMOTELY CONTROLLED LAB AND TAKEN ALL NECESSARY SAFETY PRECAUTIONS

- Ge/NaH/H_2

  Expect ^{4}He and ^{3}He

- Ge/NaD/D_2

  Expect ^{4}He and ^{3}He + some Lithium

1. Show what steel reactor does at maximum power of heater
2. Show what steel does with fuel in at maximum power of heater

Conclusive test?

- Reactants Na, NaD and Sb (or maybe as indicated in table/patent) slowly rise to 950-1050ºC over 2-12 hours then hold in this range for as long as convenient to ensure maximum synthesis
- Ash should contain
  ^{6}Li not present in the fuel

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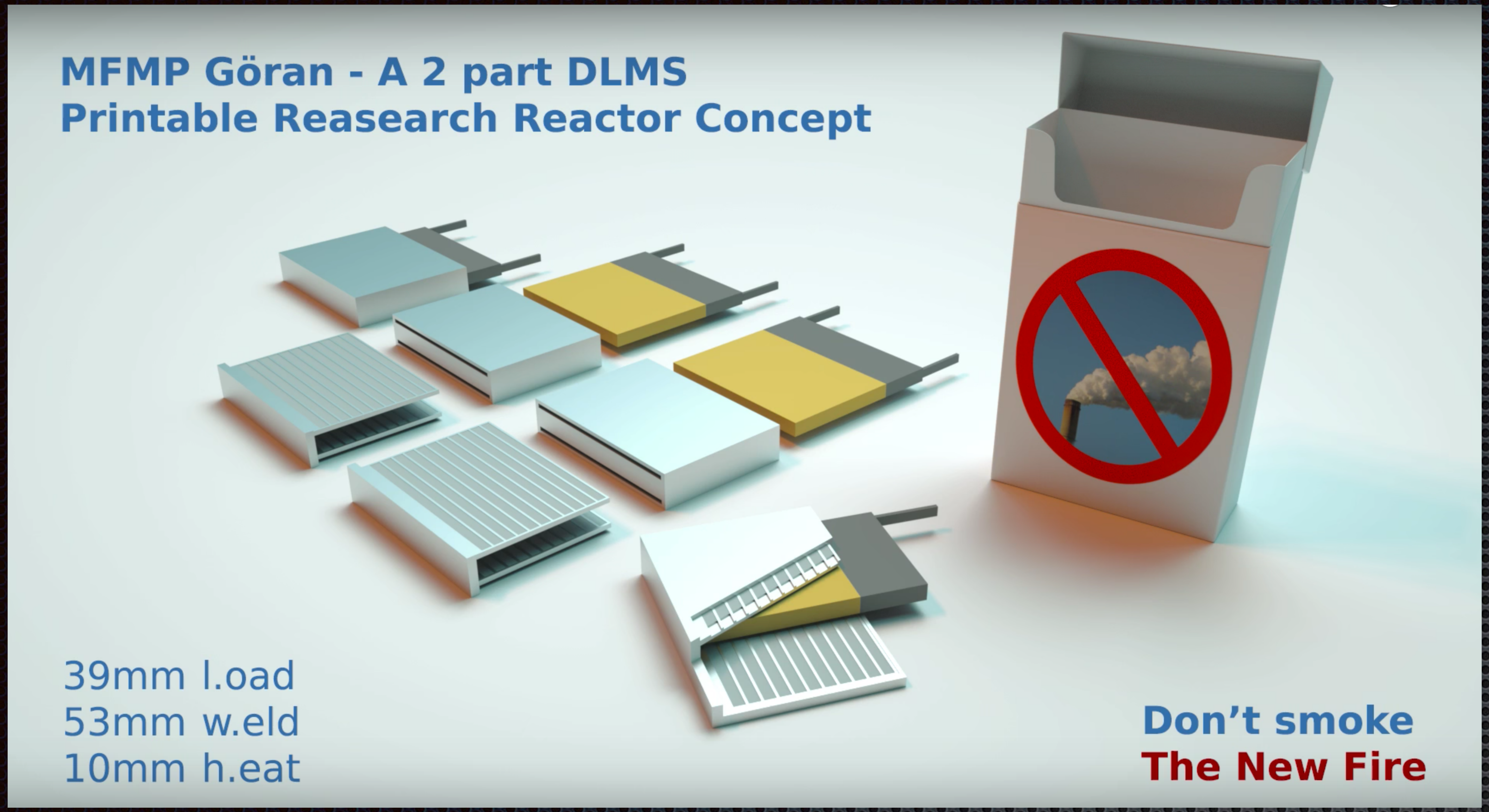
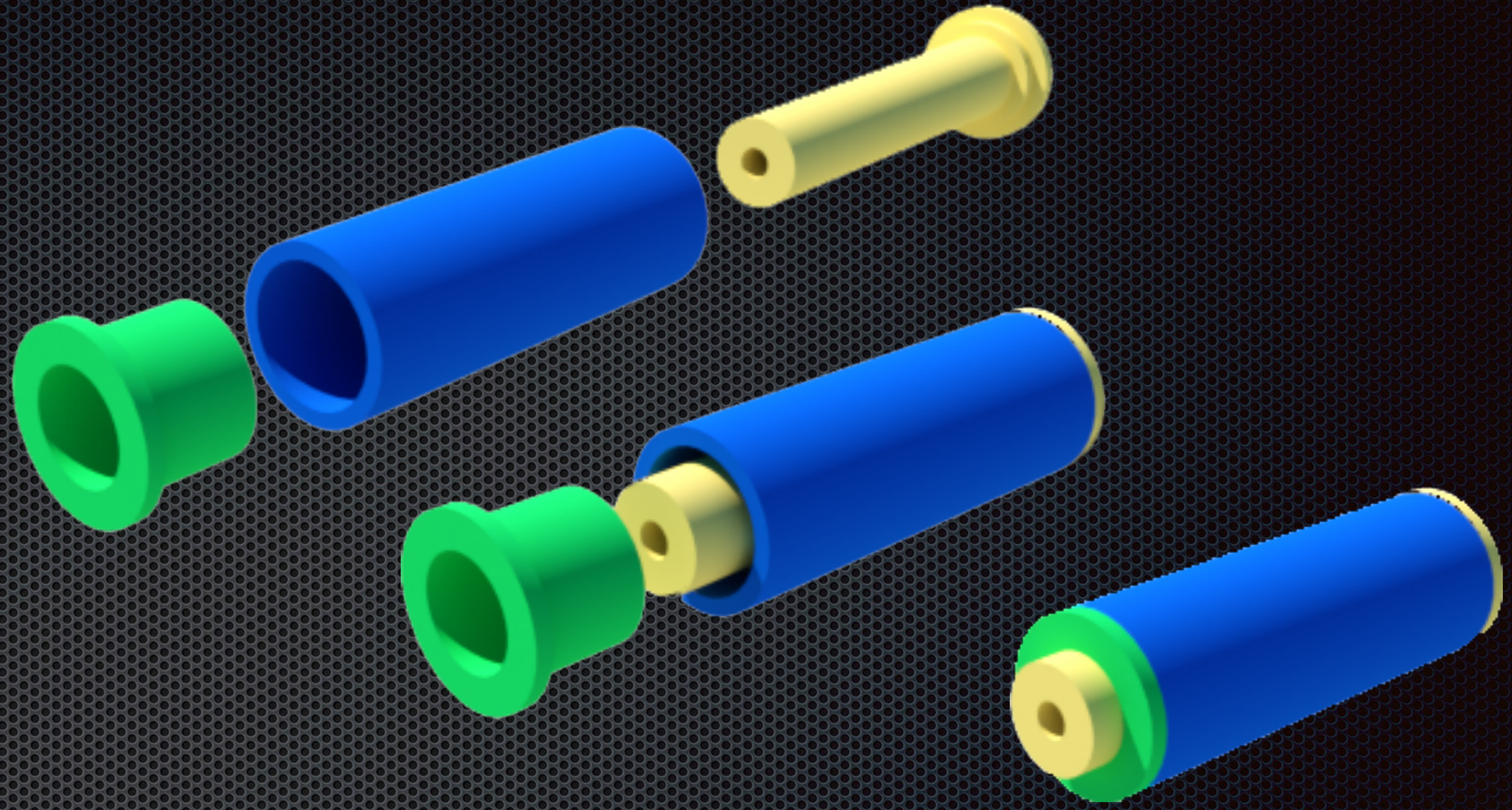
(B/D)	^{4}He	0.30
	^{6}Li	trace
	^{7}Li	trace

What makes this really special?

- It is a liquid, double catalytic chemical system, simple preparation
- Driven only by heat
- Controllable by simple heat extraction
- Can operate over a temperature range and so enable self sustain
- Can fail safe when covalent hydride breaks down
- it requires no specially constructed nano particles or complicated electronics
- it may give insight as to how all LENR works
- it will be free to deploy from May 3rd, 2026 - not a moment too soon!



Direct Laser Metal Sintering (DLMS)
Printable research reactor concept



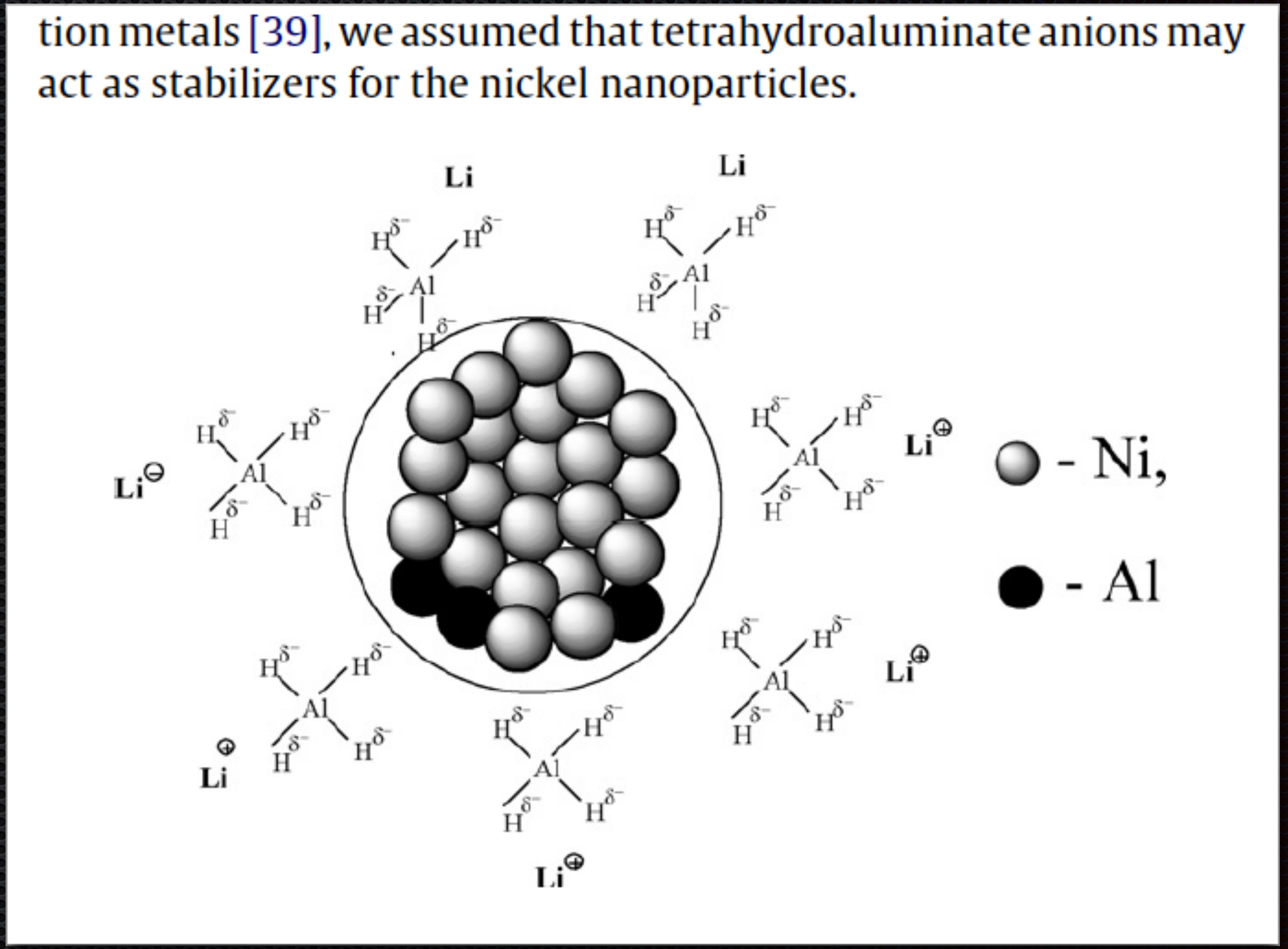
Cartridge concept: billet, lathe, drill bits and weld
4mm hole for thermocouple / cartridge heater

Thank you

- James Stevenson, for making me aware of this patent
- Patent authors for their groundbreaking research
- MFMP donors for making the research possible

Role of Nickel?

- Nickel accelerates low temperature breakdown of $LiAlH_4$
- Molten Li and or LiAl part dissolves Nickel
- Lithium Hydride formation forces creation of Nickel hydride nano particles
- Aluminium Hydride ions stabilise Nickel nano particles at 2-3nm
- This requires slow temperature rise
- Surface plasmons enhance process


tion metals [39], we assumed that tetrahydroaluminate anions may act as stabilizers for the nickel nanoparticles.

The role of lithium tetrahydroaluminate in the formation of nano dimensional nickel hydrogenation catalysts, L.B. Belykh, Yu.Yu. Titova, V.A. Umanets, A.V. Rokhin, F.K. Schmidt. Applied Catalysis A, 2011 p.71

Shock waves in condensed matter

1. INTRODUCTION

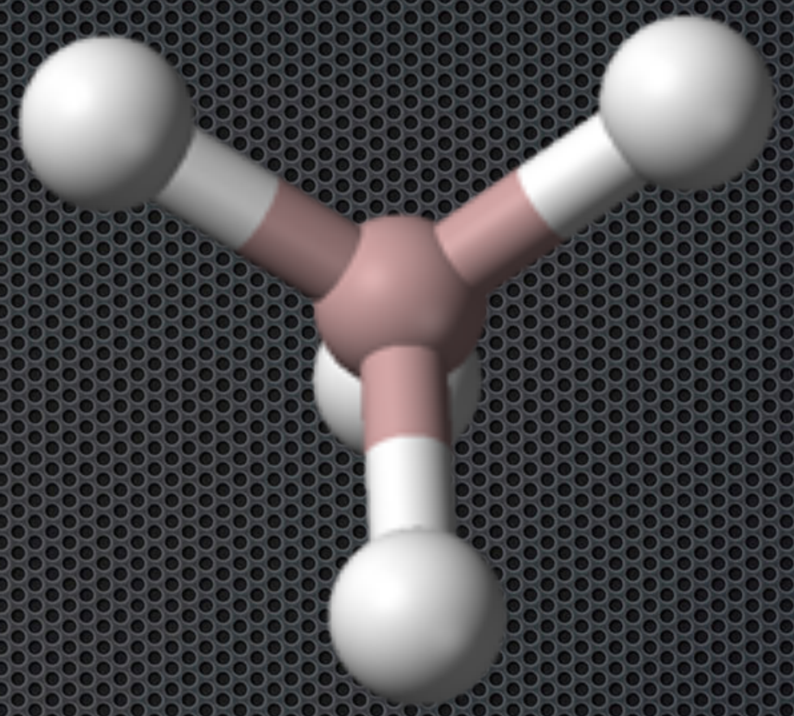
Shock waves are used to achieve high pressures and densities in condensed matter. Because shock compression is thermodynamically irreversible, it is accompanied by an increase in temperature. For example, water shocked to 30 GPa (300 kbar) is compressed more than two-fold in density[1] and heated to 2000K.[2] The shock compression of molecular fluids is of particular interest because of the phenomena that occur at high densities and temperatures: strong intermolecular repulsion, molecular rotation, vibration, and dissociation, electronic and molecular ionization, and chemical decomposition and reaction. Results for a number of fluids will be reviewed in terms of these phenomena.

Source

Shock in LiAlH4

Huge-pressure-induced volume collapse in LiAlH4 and its implications to hydrogen storage

In summary, on application of pressure α-$LiAlH_4$ transforms to β-$LiAlH_4$ at 2.6 GPa and this transition is associated with a 17% volume collapse, apparently originating from electronic transition of Al-*s* to -*p* states. Above 33.8 GPa the β phase transforms to γ-$LiAlH_4$ with a negligible change in volume, but with an increased coordination number of Al from four to six. The electronic density of states confirms that all these phases have nonmetallic character up to 40 GPa. The energy difference between α- and β-$LiAlH_4$ is small, the α to β transition pressure is relatively low, the equilibrium volume for β-$LiAlH_4$ is low (implying efficient storage of hydrogen), and the relative weight content of hydrogen is high, and hence, the β phase stands out as a promising candidate for hydrogen storage.



1.59 and 1.64 Å

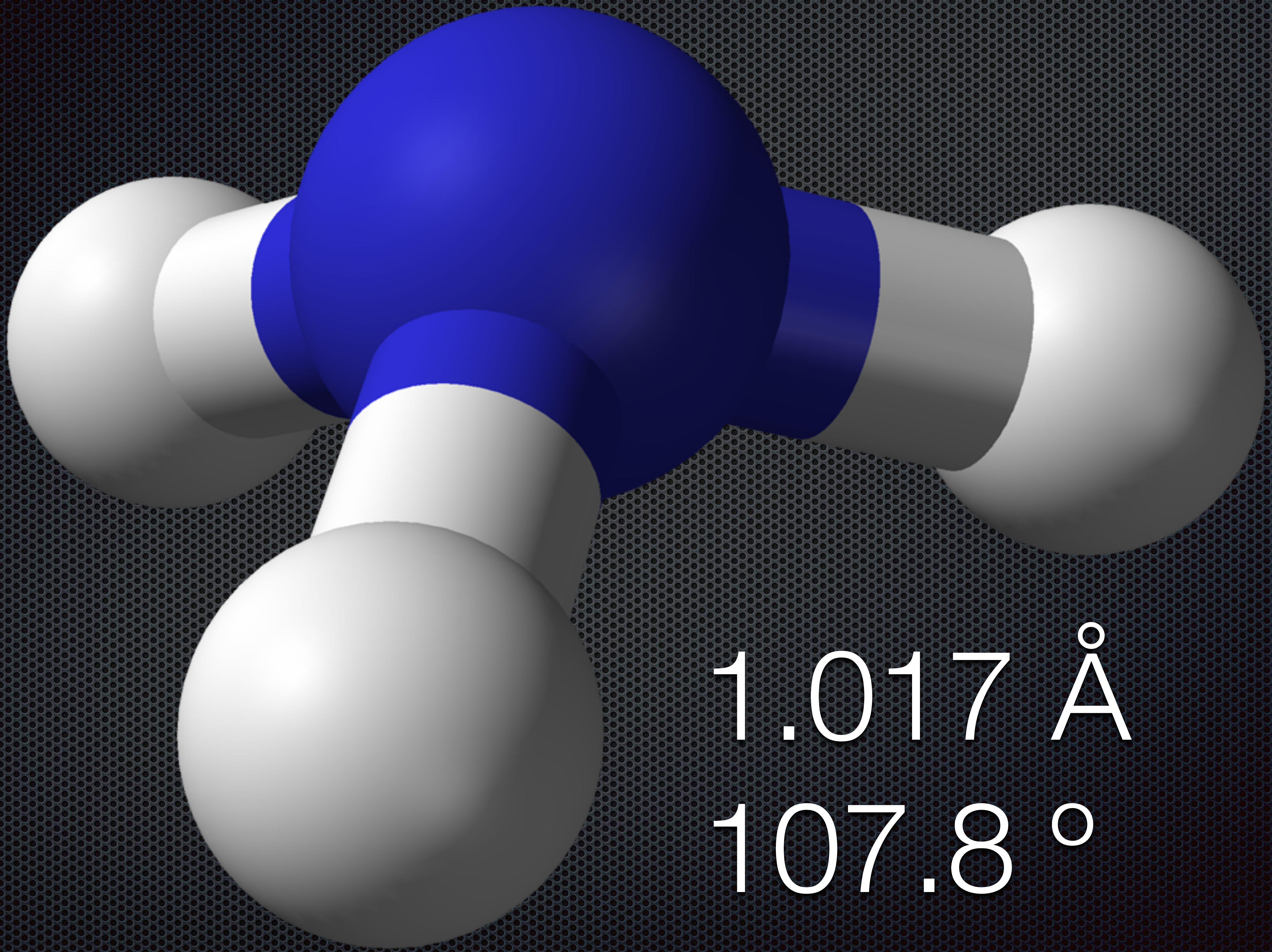
1.23 and 1.36 Å

Shorter H-H-H-H than in other embodiments

phase transition. Moreover, on going through the β to γ transition the tetrahedral environment of Al in the β modification is changed to a strongly deformed octahedral environment in the γ modification (four H atoms at distances of 1.23–1.36 Å and two further H atoms at some 2.25 Å). The identification of AlH_6-configured units in the γ phase is consistent with the measured infrared spectra.[20]

Could kinetic impacts due to high energy Alpha/4He stimulate reaction?

Ammonia?



1.017 Å
107.8 °

Source

Other tests…

- ^{62}Ni enriched Nickel + $Al_2{}^{18}O_3$ + H_2 - look for e+ e- dual 511keV annihilation photons (proof of Piantelli) or potentially ^{19}O, 26.5s 4.8MeV gamma decay to stable ^{19}F evidence of slow neutrons - Stoyan Sarg
- ^{62}Ni enriched Nickel + $LiAlH_4$ + Li + $Al_2{}^{18}O_3$
- $LiAlD_4$ + Li + Ni + $Al_2{}^{18}O_3$: look for e+ e- dual 511keV annihilation photons evidence of ^{27}Al + alpha > ^{30}Si+p