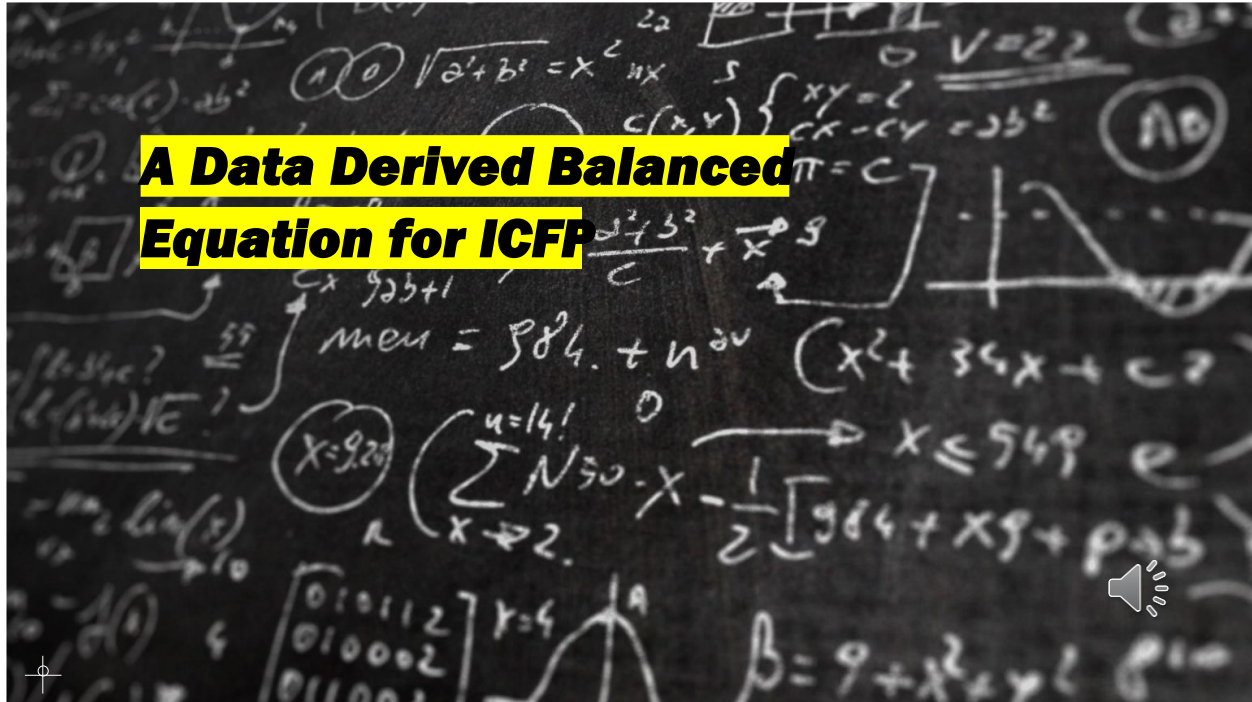


# A Data Derived Balanced Equation for ICFP



Hello. I am Doctor Gene K. This presentation is “A Data Derived Balances Equation for ICFP”. In a prior presentation I explained that when a reaction equation can be derived from data there is a high degree of certainty that the reaction occurs. In this presentation one will show that to be the case for the Kidman reaction. A presumptive conclusion of the Kidman reaction is that a cluster accelerates particles to the energies necessary for fusion and fission. Also, it absorbs the energy from nuclear reactions and uses it for acceleration of particles. Those presumptive conclusions provide hope for the goal that some alternative to building a Tokamak could lead to an endless supply of energy.

Convincing believers is easy, they believe everything without checking. Convincing hard skeptics is impossible, they refuse to check anything. This presentation is for the people who want to know enough to check the facts and analysis. There is no deception and no conspiracy. The logic should be simple enough for someone to create a spreadsheet and get the results shown in this presentation. I challenge the reader to check it out.

## **Before Reaction HT1 and After Reaction HT2**

SAMPLE ID		HT1	HT2
INLET   PRESSURE	torr	219	333
NITROGEN	ppmv	49042	61085
OXYGEN	ppmv	13254	3211
ARGON	ppmv	542	592
CO2	ppmv	ND	497
MOISTURE	ppmv	402	10705
HYDROGEN	ppmv	3321	3937
METHANE	ppmv	ND	ND
AMMONIA	ppmv	ND	ND
DEUTERIUM	ppmv	933379	917980
FLUOROCARBONS	ppmv	ND	ND π
BENZENE	ppmv	60	ND
UNKNOWN*	ppmv	ND	1993



Here is the chemical analysis from Santilli's patent application on ICFP. The before-reaction sample is HT1 and the after-reaction sample is HT2. These are mass spectra. The ppm measurement is based on volume, not mass. The assay lab has run many gas samples and based on those standards; they can use various atomic mass unit detection slots to predict any of the compounds listed. Note that the ratio of nitrogen to oxygen in HT1 is approximately 78 percent to 21 percent which is ratio of these gas in atmospheric gas. Further the hydrogen is very low compared to the deuterium which confirms the high purity of deuterium. A little bit of benzene is expected from the phenolic seals. Overall, the starting sample is as expected for deuterium contaminated with a little bit of atmospheric gas.

## Reaction Balance ICFP

Component	PPM Volume Basis		Nucleon per ppm Mole Fraction		
	HT1	HT2	HT1	HT2	HT2-HT1
Nitrogen	49042	61085	1373176	1659838.3	286662.3
Oxygen	13254	3211	424128	99715	-324412
Argon	542	592	21680	22980	1300
CO <sub>2</sub>	0	497	0	21221	21222
H <sub>2</sub> O	402	10705	7236	186996	179760
Hydrogen	3321	3937	6642	7641	999
Deuterium	933379	917980	3733516	3563415	-170101
Benzene	60	0	4686	0	-4686
Unknown	0	1993	0	10691.7	10691.7
<b>Total</b>	<b>1000000</b>	<b>1000000</b>	<b>5571064</b>	<b>5572499.85</b>	<b>1436</b>

Now let's talk about mass balance and stoichiometry. Santilli didn't do it, so I did. The numbers in the first two columns come right from the prior slide. If only a chemical reaction occurs, then nucleon numbers are conserved between the before and after sample. If a nuclear reaction happens nucleon move around but they are still conserved. So, to do a reaction balance for both chemical and nuclear reactions, I need the assay column converted to a number that is proportional to number of nucleons by % mole fraction.

## **Volume % = Mole %; Nucleons per Mole**

- Mole fraction of gases are ppmv.  $PV/TR=n$
- i.e 933379 ppmv deuterium means of gas present, 93.3379 % of moles of gas are deuterium.
- Mole fractions x number of nucleons for each isotope creates numbers which is proportionate to nucleons in that fraction. Ppmv x nucleons per molecule.



So, let's side-step

The gas law states  $PV = nRT$ . That creates an equality such that volume % is mole percent. For example, the deuterium before reaction sample was 933379 ppmv. That means that of all the moles of gas present in the sample 93.3379 % of the moles are deuterium.

Next if I have mole percent is like knowing how many atoms of gas that one has. Further, if I have 5 atoms of isotope 14, I have  $5 \times 14$  nucleons. So, if I only have one isotope of an element then mole fraction x number of nucleons in that isotope is a number that is proportionate to nucleons in that fraction.

**All the element to consider have a single isotope which is in excess.**

- Nitrogen,  $N_2$  is 99.63%  ${}_7N^{14}$ .
- Hydrogen,  $H_2$  is 99.985%  ${}_1H^1$ .
- Oxygen,  $O_2$  is 99.759%  ${}_8O^{16}$ .
- Argon, Ar is 99.6%  ${}_{18}Ar^{40}$ .
- Carbon, C is 98.89%  ${}_6C^{12}$ .



The balance could be much more complicated here. However, for each element one needs to consider there is a single isotope which is excess in its natural distribution over other isotopes of same element. One can use the atomic number 14 for all nitrogen in the sample with little error in the number of nucleon present. The situation is the same for each of the elements under consideration. One can also use an atomic number of two for deuterium.

## Reaction Balance ICFP

Component	PPM Volume Basis		Nucleon per ppm Mole Fraction		
	HT1	HT2	HT1	HT2	HT2-HT1
Nitrogen	49042	61085	1373176	1659838.3	286662.3
Oxygen	13254	3211	424128	99715	-324412
Argon	542	592	21680	22980	1300
CO <sub>2</sub>	0	497	0	21221	21222
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So, returning to the reaction balance. The value under HT1 PPM Volume basis times 14 x 2 give the value of under HT1 nucleons per ppm mole fraction. So, atomic mass time ppmv gives a proportional number for the value in that column. One does the same operation for nucleons under HT2, except because n, the number of moles of gas, has changed by reaction, one needs an adjustment to get the same basis of nucleons. One needs a proportional adjustment for total nucleons to nearly the same number before as after reaction. It is not the same number as HT1 because some of carbon of the electrode will react with oxygen and produce CO<sub>2</sub>. So, when I take the difference between HT2 and HT1 I need a slight excess. I can determine that excess when I know by mass balance how much CO<sub>2</sub> is present that didn't come from the combustion of the benzene. So, the only numbers left to account for are the proportion of nucleons in the unknown and the extra argon.

## What Accounts for the Increase in Ar?

- Molecules created by magnet-to-magnet attraction. Santilli made a multi-million-dollar business by selling a fuel gas based on production of magnecules.
- The elemental composition is determined by mass spectrographs, so every mass fraction counted in the detector sector which corresponds to 40 atomic mass units is Argon.
- Let accept that the electric arc isn't making Ar, then an increase in argon could be magnecules.  $40 \text{ amu} = \text{O}_2 (32 \text{ amu}) + 4 \text{ D}_2 (4 \times 2 \text{ amu})$ . Or  $= \text{N}_2 (28 \text{ amu}) + 6 \text{ D}_2 (6 \times 2 \text{ amu})$  Or  $= \text{N}_2 (28 \text{ amu}) + 1/2 \text{ O}_2 (6 \times 2 \text{ amu})$ .



Magnecules can account for the increase in Argon. Magnecules are molecules created by magnet-to-magnet attraction. Santilli made a business of magnecules. Further, I remind you he did extensive work on both the theory of and the measurement of magnecules.

Let use argon as an example of how the mass spectra is affected by magnecules. The elemental composition is determined by mass spectrographs, so every mass fraction counted in the detector sector which corresponds to 40 amu is argon.

Let's accept that the electric arc isn't making argon, then what magnecules could arrive in the sector corresponding to 40 amu. I have listed three possibilities in order of decreasing probabilities based on the abundance of reactants.

## **Element Component Distribution of Magnetic Unknowns**

- Assume the unknowns are magneccules. Assume all the gases can be made into magnets equally.
- A magnet would attach to any other magnet randomly.
- Magneccules create unknowns that are composed of the same elements that were present before the arc
- Therefore, the total unknown is composed of the same percentages of elements of the gases before reaction.



Let's think about the consequences of magneccules. Assume the unknowns are magneccules. Assume all the gases can be made into magnets equally.

By observation of magnets, one deduces a magnet would attach to any other magnet randomly.

Then by deduction: unknowns are composed of the same elements that were present before the arc. Hence if one mass balances the total unknown, one sees that it is composed of the same percentages of elements of the gases as is present before reaction.

Closing the mass balance is impossible unless the unknown is composed of gases that are assayed. Hence, if the mass balance closes with high accuracy this assumption must be true.



# Reaction Balance ICFP

Component	PPM Volume Basis		Nucleon per ppm Mole Fraction		
	HT1	HT2	HT1	HT2	HT2-HT1
Nitrogen	49042	61085	1373176	1659838.3	286662.3
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So, the extra argon is one or more magnecoles with an amu of 40. In sample HT1 four gases (nitrogen, oxygen, deuterium and hydrogen make-up 99.9% of the gas. For the unknown one uses both the proportions of the major gases and their atom numbers of their most abundant isotopes. So, the values of nucleon columns of HT2 are calculated like the values of nucleons column of HT1 but the values include a percentage adjustment to that the total to provide a number that is just slightly larger than the total for HT1. The difference between HT1 and HT2 is the change due to reaction. Because the basis is conserved nucleons, the reaction difference includes both chemical and nuclear reactions. Pay attention to the number in the difference column; those numbers need to go to the next slide.

# Element Balance of Reactions

	Component distribution to elements						Nuclear Change
	HT2-HT1	CO2	H2O	Unknown	Benzene	Argon	
Nitrogen	286662			2656			289318
Oxygen	-324412	15434	159787	820		1040	-147331
Hydrogen	999		19973	13	-360		20625
Deuterium	-170101			7221		260	-162620
Carbon		5788			-4326		1462
Total		21222	179760	10697	-4686	1300	1454



The next step is to find out which reaction differences are chemical, and which are nuclear. One does that by making a mass balance of the elements. The numbers from the difference column from the last chart are in the first column of this chart and in the bottom row. So, how are the nucleons distributed: they are distributed by mole percent. For example, the molecule weight of CO<sub>2</sub> is 44, the mole percent carbon is 12/44 and mole percent O<sub>2</sub> is 32/44. So, one uses those fractions to distribute the difference back to elements. One uses the same procedure to distribute nucleon for H<sub>2</sub>O, the total unknown, and benzene. The argon's nucleons are distributed based on same reasoning the produced the values in nucleon portion of prior chart. Once distributed one can remove the chemical changes to create the values in the column under nuclear change. Note that the carbon value under nuclear change isn't nuclear it's the carbon that came from the electrode to become CO<sub>2</sub>. Let's look back at the previous slide.

## Reaction Balance ICFP

Component	PPM Volume Basis		Nucleon per ppm Mole Fraction		
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<b>Total</b>	<b>1000000</b>	<b>1000000</b>	<b>5571064</b>	<b>5572499.85</b>	<b>1436</b>



So, the number at the right on the bottom is that excess to account for carbon from the electrodes. That number is adjusted to be approximately the same as the number in bottom at right in element balance in the next slide.

# Element Balance of Reactions

	Component distribution to elements						Nuclear Change
	HT2-HT1	CO2	H2O	Unknown	Benzene	Argon	
<b>Nitrogen</b>	286662			2656			289318
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<b>Carbon</b>		5788			-4326		1462
<b>Total</b>		21222	179760	10697	-4686	1300	1454



So, the excess here contributed to carbon is approximate the same excess contributed to carbon in the prior slide. All of the values in Reaction Balance for ICFP and Element Balance for Reactions, one should be able to reproduce if one has followed the logic and placed the right numbers and equations in one's spreadsheet. Next, take note of these nuclear change values; they go on to determine stoichiometry.

ELEMENT	NUCLEAR CHANGE	PPM VOLUME	CALCULATED COEFFICIENT	INTEGER COEFFICIENT	EXCESS OF MAIN RX	CALCULATED COEFFICIENT	INTEGER COEFFICIENT
Nitrogen	289318	10333	1.999765	2	0	0	0
Oxygen	-147331	-4604	-0.89106	1	-0.108942	1	1
Hydrogen	20625	10312	1.995843	2	0	0	0
Deuterium	-162620	-40655	-7.86821	7	-0.86821	-7.969471	8

## Main and Side Rx Stoichiometry



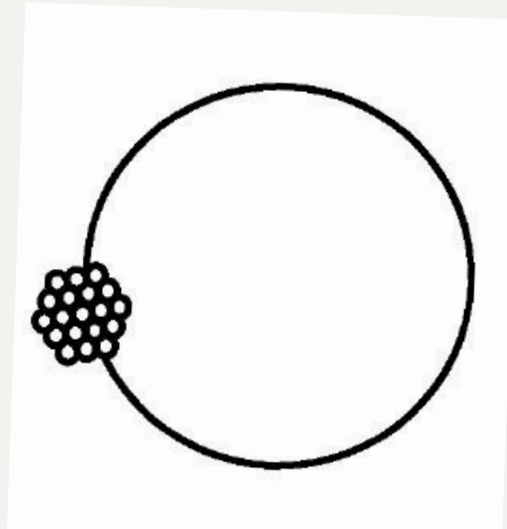
Dividing the nuclear change by nucleons per molecule renders the values in ppmv. Ppmv is also mole%. To generate the stoichiometry, one divides all of ppm volume column by a common number. In this case the number was 5167. That operation creates the coefficients for the balanced equation. It is reasonable that the integer value of a coefficient is a true value. Therefore, the coefficient is predicted with an accuracy of 3 decimal places. But wait. There could be more than one reaction. By taking the excess of main reaction, one can solve for a second reaction happening at the same time. One divides the missing oxygen by itself to create the coefficient one, then uses the same number to divide the missing deuterium. If one follows the convention that a minus sign is for reactants and positive sign is for products, one sees what sign needs to apply to coefficients for the side reaction. That reaction indicates that some of the deuterium produces oxygen which is consumed to produce nitrogen in the main reaction. The overall precision then is approximately the same as assay accuracy which is plus or minus three ppmv for mass spectral measurements.

There appears to be no denying the reality of the Kidman reaction.

There were assumptions made about magneclules which one assumed were true because of the results. I ask how can one get such precision of stoichiometry if the assumptions are not true?

**Absorber**

**Accelerator**



So, what does all this suggest we investigate next. Let's review this absorber/accelerator model. The clusters have been observed in LENR by Miley. The same mechanism happens here. I see no logical alternative to the absorber/accelerator model. How does it overcome the coulomb barrier? It does that because it is an accelerator. Where does the energy come from for the accelerator? The cluster is a near perfect energy absorber. Why is the reaction an overall reaction? Because there are a series of elementary reactions which happen to the absorbed target oxygen? None of the intermediate elements escape because the target remains bound or at least it does at the reaction temperature of Santilli's intermediate fusion. The absorber aspect tells us the nuclear reaction has its own containment system. One doesn't need a tokamak. One doesn't need to stuff hydrogen in a metal lattice. Of course, there are many questions about how this absorber/accelerator happens. These questions are for a future investigation.

The good news is that this absorber/accelerator model is a great one. I have discovered and proven a great many details about this model. Those details will be presented. But the next question is "Does the Kidman reaction occur if the arc is in water rather than in a mixture of gas?" One wants to know "Is there is a chance that the absorber/accelerator can be generalized to other data from cold fusion experiments?"