Collective low energy nuclear reaction may cause overunity in Graneau's water explosion

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Abstract

The Russian scientists D.V. Filippov and L.I. Urutskoev pioneered experimental research and theory exploration and they named such reactions as transformation, or **C-LENR** (Collective Low Energy Nuclear Reaction). In this paper, I present some comments for the intrinsic mechanism, and at last, my conjecture is proposed for alternative explanation on the overunity phenomenon in Graneau's water explosion experiment.

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What is collective low energy nuclear reaction?

Under extreme magnetic field and necessary exciting energy, two and more atoms can transform new atoms with circa **keV** level energy transaction per collective reaction that is significant more than regular chemical reaction but far less than regular nuclear reaction.

For examples:

$$Li^{7} + Ni^{60} + 2H^{1} \rightarrow N^{15} + Mg^{25} + Si^{29} + 437eV \text{ (without electron involvement)} \quad (1)$$

$$Ti^{48} + 2Ar^{40} + O^{16} \rightarrow N^{15} + Cl^{37} + Ar^{38} + Cr^{54} + 2.67keV \text{ (ditto)} \quad (2)$$

$$2Ti^{47} + 2Ar^{40} + C^{12} \rightarrow O^{16} + S^{34} + Ca^{46} + 2Sc^{45} - 5.13keV \text{ (endothermic)} \quad (3)$$

$$V^{51} + Ti^{48} + O^{18} \rightarrow Fe^{57} + Na^{23} + Cl^{37} + e + 883eV \text{ (analog to } \beta\text{-, but multibody)} \quad (4)$$

$$5O^{16} + 2C^{12} + e \rightarrow Na^{23} + 2H^{1} + 2N^{15} + Ne^{20} + Si^{29} + 1keV \text{ (analog to EC, but multibody)} \quad (5)$$

The first **3** of **5** reactions seem that all neutrons and protons of reactants are just re-kneaded in order to form other new elements, but in the last **2** reactions, a neutron (or proton) in some uncertain atom decays to proton (or neutron) with emission of electron and antineutrino (or electron capture and neutrino).

Theoretically, the reactions **(1)(2)(3)** are strong force nuclear reactions, but the others are electroweak reactions, and supposedly the former should be quite easier than the latter.

The Russian scientists D.V. Filippov and L.I. Urutskoev pioneered experimental research [1], and they named such reactions as transformation, or **C-LENR** (Collective Low Energy Nuclear Reaction). They conjectured many such reaction equations, but accurate energy not given, the above **5** equations are brought in from their paper, but patched with my energy calculations.

They observed the nuclear transformation of chemical elements on a macroscopic scale (**10^{19}** above nuclei per shot) in their titanic foil electric explosion experiments. Specifically, the transformation of isotope **48Ti** yields rather wide spectrum of chemical elements that result in a substantial distortion (~ **10%**) of isotopic ratio in the remains of titan.

No unstable isotope is involved or generated, i.e. initial and final ensembles all stable isotopes.

Obvious heat anomalies in experiments or isotope distribution shift suggest that: the cross section of such nuclear transformation is almost equivalent to or near matchable with regular chemical reaction.

Although heat anomalies are often observed, not like the **LENR**, here **C-LENR** is not necessarily always exothermic, for example, the **3rd** is just endothermic.

Many other teams reported similar experiments with similar or different configurations.

Why is collective multibody quasi beta decay easier than regular one?

Reaction **(4)** is analogue to **β** decay, hence, supposedly there should be anti-neutrino emission, and reaction **(5)** is analogue to **EC** decay, hence, supposedly there should be neutrino emission, though neutrinos are not added to these **2** equations.

Hereby I term the likes of reactions (4) or (5) as **multibody quasi beta decay**.

The regular beta decay is natural "burning" of single nucleus, and large spin momenta change may occur, and is difficult to levy on daughter particles, that is why spin lock is easy to frustrate beta decay, e.g. $\mathbf{V^{50}\ (J\pi = 6+) \rightarrow Ti^{50}\ (J\pi = 0+) + e^{+} + \nu + 2207keV}$, what a difficulty it will have to distribute the big $\mathbf{\Delta J = 6}$ spin! No wander its $\mathbf{t_{1/2}}$ = $1.5*10^{17}$ years, though with magnificent Q(β).

But in multibody beta decay, there always exist many **momenta undertakers**, hence supposedly such special beta decay should be easier.

The Russian team also conjectured some more special collective quasi beta decay with involvement of multiple electrons or positrons as follows (I patch accurate energy again):

$$\mathbf{8Ti^{48} + 3O^{16} + 6e \rightarrow Be^{9} + O^{18} + 4Ti^{49} + 2Ti^{50} + Cr^{52} + Fe^{57} + 6.66keV} \quad \mathbf{(6)}$$

$$\mathbf{11Ti^{48} + 2O^{16} + 4e \rightarrow He^{4} + C^{12} + Cl^{37} + 7Ti^{49} + Cr^{53} + Mn^{55} + Fe^{56} + 9.88keV} \quad \mathbf{(7)}$$

According to angular momenta conservation law, reactions **(6)(7)** do not have to emit neutrinos. Therefore, personally I think it is not quasi beta decay, but pseudo beta decay, because of needless of neutrino involvement.

But according to lepton number conservation, neutrinos should always accompany, unless symmetry is totally broken. Recent years, violations of the lepton number conservation laws are often observed and undergo challenge, such as neutrino oscillation.

Even in future some day, neutrino is proved to be **Majorana particle** by observed $\mathbf{0\nu\beta\beta}$ decay, it will still violate lepton number conservation laws.

If above **2 neutrinoless** reactions could be true, supposedly should be further easier than orthodox beta decay, even on par with reactions (1)(2)(3), thus can be regarded as strong force nuclear reactions, not just electroweak beta decay.

The team only presented equations with even number but without any odd number multi-electron involvement.

But if we can concoct a similar equation with odd multi-electron involvement, then neutrinos should still appear.

How can it occur and is the Coulomb barrier hypnotized?

As to the underlying theory, the team favored in the theoretical physicist Georges Lochak hypothesis that the phenomenon may be resulted from symmetry breaking by electric discharge in water and formation of **magnetic monopoles** in an extended standard model [2][3].

But one question is still not yet answered: how the re-knead processes overcome the coulomb barrier? For example, in experiment of water-immersed titanium foil explosion, the discharge voltage is only **50kV**, so the energy of accelerated protons or electrons is supposedly less than **50keV**, and obviously less than the regular **MeV** level coulomb barrier.

The answer may be addressed by the **EV** (Electron Validum) theory proposed by **dissent** experimental physicist Kenneth Shoulders (ref. **4**). He believed that a large cluster of electrons can be "compressed" densely into his **EVO** (Exotic Vacuum Objects) quasi-particle with **super strong electric field** that can power protons to **MeV** level, though I doubt how the coulomb repulsion is accidently weakened by his explanation.

I have a different explanation on this phenomenon: perhaps it is the Bosonization effect [8] that joins enough even-number low energy incident particles together into a big boson quasi-particle with high spin and over-threshold energy.

For example, assuming threshold energy of breaking Coulomb barrier is **1MeV**, then at least 20 hot 50keV protons or electrons should be packed to form 1MeV energetic boson quasi-particle, though such a temporary bundle is not as dense as a real nucleus.

The boson quasi-particle may be similar to, but certainly larger than so-called halo nuclei. Some highly unstable nuclei have halo, e.g. Carbon-22, their nucleons are loosely bounded, but its size should be still far less than the boson quasi-particle or **EVO** in Shoulders heresy.

Bosonization on neutral particles, e.g. neutrons & neutrinos, is greatly easier than on charged particles e.g. protons & electrons, because of non repulsive Coulomb force, but charged Bosonization will form extremely strong local electric field, and tear any approaching atom or ion, so as to trigger nuclear electron capture or other fierce reactions.

Two classes of implementation

In fact, electric current can induce nuclear reaction, and all such reactions can be divided into **2** classes: the first is the gentle class, i.e. the low voltage electrolysis class, and another is the violent class, i.e. the high voltage pulse discharge class.

The gentle class

The **gentle class** has been widely studied with the fruits of a handful of new theories & conjectures for decades and decades in cold fusion republic since 1989, the palladium cathode plus heavy water solvent is the most typical one. This class did always report excess heat observed more or less.

Of this class, only a few of configurations may be caused by **C-LENR**, such as carbon electrodes + water circa **10VDC/5A** arcing (ref. **5**), in my point of view, could go with the afore-listed **5th** equation at least:

$$5O^{16} + 2C^{12} + e \rightarrow Na^{23} + 2H^{1} + 2N^{15} + Ne^{20} + Si^{29} + 1keV$$

But flowing chemical exothermic reaction must also take quite proportion of the anomalous heat (because its cross section is extremely larger than nuclear reaction):

$$C + O_2 \rightarrow CO_2 + 4.1eV \text{ (i.e. 393.5kJ/mol)}$$

The violent class

The **violent class** that executes high voltage pulse discharge from hobbyist' **kV** level to Sandia's **Z**-pinch **MV** level, is relatively less studied and reported. In my experience, this class does not always have anomalous heat output, and depending on the choice of electrode materials, even energy deficit can happen because of possible endothermic **C-LENR**, so this class may be only good to precious element synthesis by so-so **HV** (High Voltage), or orthodox hot fusion by top HV, or direct mechanic energy output by mediocre HV.

Re-explanation on overunity of Graneau's water explosion experiment

When studying water arc explosion, the famous scientist Peter Graneau have found anomalous excess mechanic energy output of exploding water fog, but unfortunately he was not aware of something to do with nuclear reactions (ref. **6**).

Perhaps due to his random but lucky pick of right material for electrodes, otherwise, no excess energy would be seen, just like the unlucky Canadian engineer George Hathaway who failed to copycat that experiment, and then rebutted Graneau's claims (ref. **7**).

Even both of them picked copper as electrode, it is still hard to say which guy is lucky because not every copper conductor was created equal and even minor impurity does matter.

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