Which elements can be candidates of concatenating ββ decay nuclear fuel?

Yanming Wei
Kiwaho laboratory of energy and ecology Inc. K0E1S0, Ontario, Canada.
Email: yan@kiwaho.com

Abstract

With the catalysis of focused neutrinos and other special means, some of those **2β** isotopes can be outstood for fuel, provided it becomes possible for **2** sequential events of concatenating $\beta_1\beta_2$ with total energy $Q(\beta_1) + Q(\beta_2)$ positive balance. This research paper at least proposes molybdenum **100Mo** as promising candidate.

DOI: 10.13140/RG.2.2.33906.50884

Introduction

Although we have limited feasible choices for **β** fuel, such as **176Lu** [1], however more alternative candidates are always desirable and worthy to explore.

Many isotopes have potential of **double β** decay that is regarded as a single burst event of simultaneously emitting **2** electrons or positrons, unfortunately half life is too extremely long time to be nuclear fuel if no way of decay acceleration. By the way, Majorana **0νββ** researcher's enthusiasm is still highly motivated by non-energy interest in pure theory.

I do not care about Majorana pure theory, I only care about energy. Fortunately the branch ratio of regular non-**0νββ** (i.e. 2**νββ** and $\nu\beta_1 + \nu\beta_2$) is far greater than the extreme unlikely **0νββ**.

With the catalysis of focused neutrinos and other special means, some of those **2β** isotopes can be outstood for fuel, provided it becomes possible for **2** sequential events of concatenating $\beta_1\beta_2$ with total energy $Q(\beta_1) + Q(\beta_2)$ positive balance.

Generally speaking, not only beta or double beta fuel isotope, but also fission fuel, must be the one with very low or even the lowest abundance amid its sibling isotopes, because only stable isotope can survive forever with dominant abundance, if not, how can it be called decaying & gradual vanished unstable isotope? That is why fission fuel is the 0.7% 235U not 99.3% 238U.

The pattern of sign +/- combination of $Q(\beta_1)$ and $Q(\beta_2)$

Studies show that **$Q(\beta_1) < 0$ & $Q(\beta_2) > 0$** is the mainstream property amongst all natural existed **2β** isotopes, except calcium **48Ca** & zirconium **96Zr** which **$Q(\beta_1)$ & $Q(\beta_2)$** are both positive.

But nothing is worthy of sensational celebration even both separate betas are energetically possible, i.e. ++ combination, because usually high spin lock does block the first beta decay, i.e. the first step is crippled.

As focusable neutrinos are very low energy, if the first beta decay wish to be catalyzed, then the absolute **$|Q(\beta_1)|$** should be as low as possible, as well as the nuclear first energy level **E_1** cannot be too high.

The **E_1** of **48Ca, 96Zr** are **3831keV, 1581keV** respectively, such high excitement energy obviously spoil the willful neutrinos catalyst.

Nomination on merit of favorability by thermal neutrinos

Perhaps most eminent isotopes are molybdenum **100Mo**, selenium **82Se,** and cadmium **106Cd** with **$Q(\beta_1)$**: **-169keV**, **-97keV** & **-195keV** respectively, especially all their **$Q(\beta_2)$** are about **3000keV** that can in turn catalyze next **β_1** decay by fast electron coulomb excitation.

More importantly, all their parameters of half life of second beta decay is very short: **15** seconds, **6** minutes (via isomer) & **24** minutes respectively. Of those, the **106Cd** is in style of electron capture then positron ejection (**ECβ+**).

Fearing negative **$Q(\beta_1)$**, eh? No worries. Even unfocused neutrinos charged current can supply enough energy to make following large endothermic reaction occur:

$$p^+ + \overline{\nu} = n^0 + e^+ - 1.29\text{MeV}$$

In 1956, the Nobel laureate Frederick Reines & Clyde Cowan had set up experiment to prove above reaction true provided the threshold energy of antineutrino is larger than **1.29MeV** + positron mass = **1.8MeV**, though the cross section is extremely small.

Now that we can focus low energy thermal neutrinos, of course, overcoming **Q(β_1)** a few of hundreds **keV** is not big deal, and surely exponential high cross section is expected. Moreover, as the half life of ensuing **β_2** of well-selected fuel is very short, the quasi-instant gained **Q(β_2)** circa **3MeV** is capable enough to pay back the **Q(β_1)** debt, and such a positive feedback can further catalyze next **β_1** by coulomb excitation or Bremsstrahlung photon excitation.

As to reaction equations for educational purpose, here exampled in the **100Mo**:

100Mo → 100Tc – 169keV, catalysis of focused neutrinos is needed.

100Tc → 100Ru + 3204keV, $t_{1/2}$ = 15.46s.

Interestingly & favorably, the intermediate product technetium **100Tc** can only exist a very short moment, not only that, but in fact, none sibling of isotopes of this element family can still survive in current universe, i.e. family abundance = 0, what a revelation of possible nuclear fuel!

<u>Enlightment of the Great Nature</u>

Philosophically thinking, photons can be regarded as the basic “tax” levied by the Great Nature for cosmic welfare, it comes from energy gain of every atom’s electron shell activity, so as to further cast light rays from numerous photons, because in His universal love, everywhere is created equal and should deserve of opportunity of illumination.

Without such generous and abundant basic “tax”, our human beings have to live in dark world forever, even can not survive.

In addition, neutrinos can be regarded as the luxury “tax” or nuclear “tax”.

A reasonable proportion must be deducted from the released energy of every beta decay in form of any distance reachable neutrino, so as to expand cosmic, and provide accessible Promethean nuclear igniter anywhere anytime for energy production at convenient disposal.

That is why we are being “bombarded” by abundant free neutrinos supply from the nuclear fusion powered Sun and all stars, plus comic background relic.

Perhaps, the mysterious **UFO** is just a beneficiary of such a nuclear “tax”: powered by such a simple means of focused-neutrino-catalyzed controllable **β** decay, but never by Dyson sphere.

Great advantage: clean nuclear energy!

For traditional fission fuel **235U**, roughly output **1MeV** energy per nucleon, in contrast, **β** or **ββ** fuel is roughly **20keV** per nucleon, obviously far lesser, but the great advantage is that such ideal clean energy actually features decent energy density, no risk of both nuclear proliferation and waste radioactive pollution! Of course, as the low abundance of the wanted isotopes, enrichment process is also highly preferred for commercial reactors provided costs is marginally worthwhile for profitable energy production.

Support our research with inspiration from the Great Nature

More experiments, theoretical analysis and calculation are needed for reselection or verification. Perhaps there is only **last mile** to success in my current **ββ** fuel experiments.

If thou or thy entity hath surplus disposable fund, why not to follow the goodwill of the Great Nature? I do need financial support to deeply explore all possible nuclear energy for humankind future, but my current **deplorable** status quo is not viable, despite of bearing ambition to **make America great again** and drive world civilization great breakthrough! As a quid pro quo, due credits and returns will be earmarked for thy generous contribution in hilarious celebration of the final great successes.

Textbooks assert that decay rate is invariable. However, science discovery and technology innovation are always advancing, therefore "Do not let anyone tell you it cannot be done", the **president Trump**'s voice is still resounding.

Thanks for Donald Trump's resplendent philosophic gedanken and renewal call of American spirit to encourage me continuing this unblessed & unfunded kind of lonely energy research, otherwise I have never any chance to approach success so closely until now.

Once success in **ββ** nuclear fuel, I will declare it in my twitter **@kiwaho**, just follow me now.

Reference

1. Focused neutrinos and alt-superconductor catalyzed betavoltaic nuclear reactor, by Yanming Wei, 2017 Researchgate, DOI: 10.13140/RG.2.2.27195.62248.