Specifications

Disclosed is a method, system and apparatus for generating energetic particles such as (highly) energetic protons, neutrons, and alpha particles.

An ion guns bombards a target of condensed matter medium (such as Pd, Ni, Li etc) inside a vacuum chamber with protons or deuterons or both. The bombardments leads to deposition in vacancies on the target. Where D+D → He-4 (24 MeV) or H+D → He-3 (+ 5.5 MeV) reactions take place.

In the presence of phonons -- e.g. generated by the beam hitting the target, or otherwise -- the resulting energy quanta (depending on the reaction above) get transferred to other nuclei via incoherent excitation transfer. This process only requires the exchange of several phonons.

For such incoherent excitation transfer there is a large number of possible states since energy along a continuous range can be carried away kinetically through the resulting products. Therefore, products will be along the lines below plus kinetic energy.

The transfer of such large amounts of energy (as described above resulting from the hydrogen isotope reactions) leads to the disintegration of the receiving nuclei. Which kind of disintegration takes place depends on the nuclei embedded (chosen) in the environment such as the target material. For instance, in case of a Li-6 receiving nucleus, the nucleus will disintegrate into He-5 + P (proton) with 0.86 MeV energy. The He-5 then further disintegrates into He-4 + n. The latter reaction may be undesired because of the hazardousness of neutrons. Alternative materials may be chosen such that no neutrons result. This is particularly facilitated if one does not opt for energetic protons but for energetic alpha particles, which are also useful. The D+D reaction which results in 24 MeV particularly allows for a large amount of different materials choices here since most materials will disintegrate in ways that can be evaluated for their desirability based on their reaction products.

Suitable materials for the target can be selected from the materials table in our provisional of June 3.

The energetic charged particles resulting from the above described reactions can be used for several purposes: such as for production of heat, for electric conversion, for boosting further nuclear reactions such as fusion reactions.

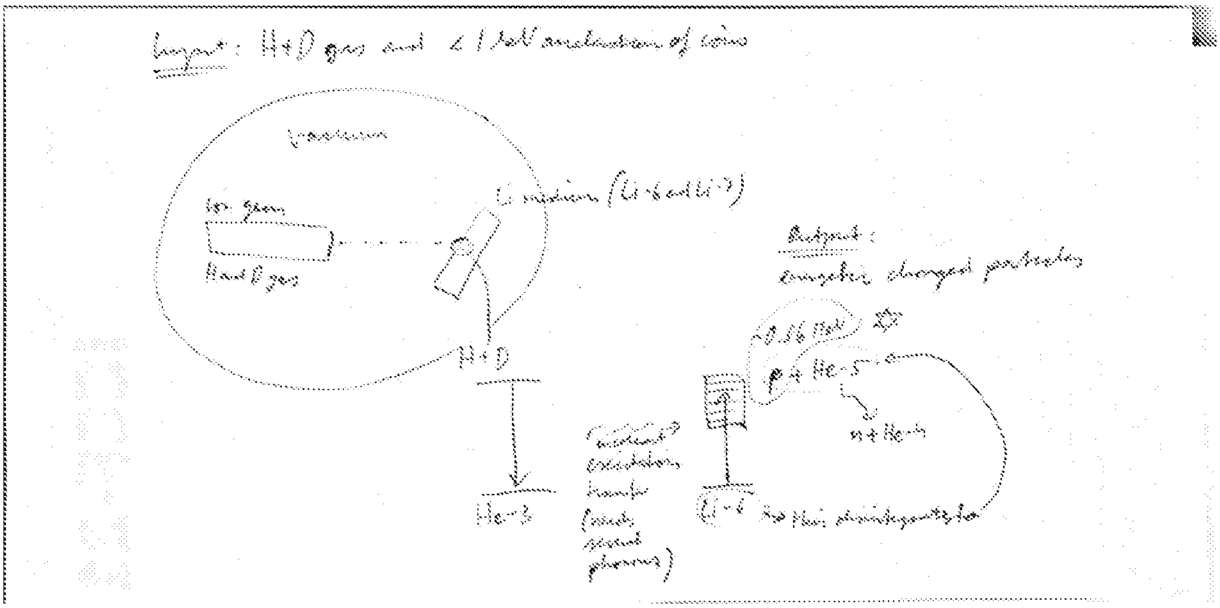
This process exhibits a very high energy gain when comparing input and output.

Degrees of freedom for engineers concern how to make this process safe and least hazardous. If the latter is desired, this encompasses the avoidance of neutrons by choosing materials that lead to alpha particles as nuclear reaction products.

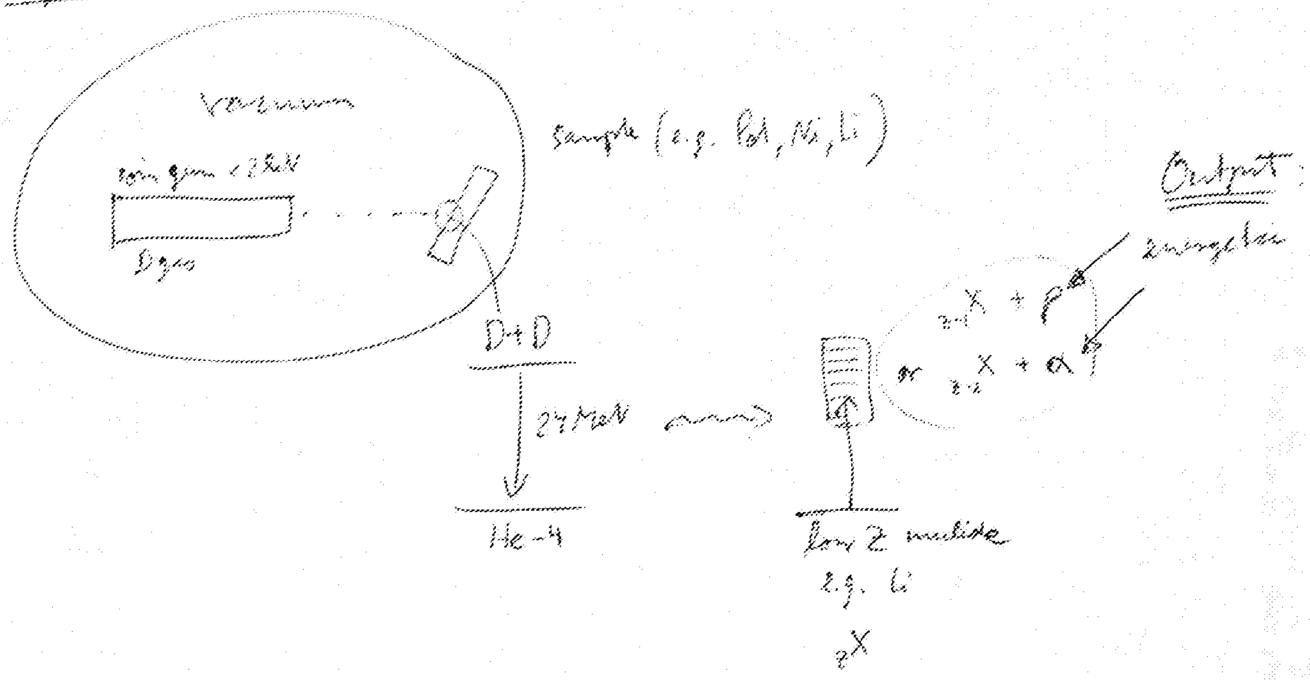
As for nuclear reactions from disintegration of a target nucleus, one can use high Z materials that eject an alpha exothermically.

The key novel mechanism at the core of this is phonon-mediated excitation transfer as described in our patent application of June 4. In this case, excitation transfer of the mass defect energies of 24 MeV or 5.5 MeV to other nuclei leads to useful energetic reaction products.

This process saves one the trouble of carefully engineering condensed matter environments for facilitating and optimizing down-conversion in coherent fusion and fission reactions.



Input: D gas and <2 keV ion acceleration



can choose materials such that there are no neutrons.

can generate heat or trigger further nuclear reaction or electric conversion of charged particles

Claims

What is claimed is:

1. A system, method and apparatus for generating energetic particles such as energetic protons, neutrons, and alpha particles

   comprising
   a particle accelerator (such as an ion gun)
   that accelerates one or more isotopes of hydrogen (such as protons and/or deuterons)
   and bombards with the beam a condensed matter medium (target)
   in which phonons are generated
   and nuclear reactions take place that involve beam nuclei and target nuclei
   from which energetic particles result.
2. A method for choosing the target materials such that hazardousness can be reduced/minimized.
3. A method for choosing the target materials such that energy efficiency (input/output ratio) can be maximized.