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Claims

1. A system for generating energetic particles comprising:

a device for generating an ion beam comprising a first group of atomic nuclei; a condensed matter medium comprising a second group of atomic nuclei; wherein the ion beam is configured to interact with the condensed matter medium so that some atomic nuclei of the first group of atomic nuclei are implanted into the condensed matter medium and undergo a first nuclear reaction thereby releasing a first energy;

wherein the ion beam is further configured to generate high-frequency phonons in the condensed matter medium; and

wherein the high-frequency phonons are configured to interact with the first group and the second group of atomic nuclei and affect nuclear states of the second group of atomic nuclei by transferring the first energy of the first group of atomic nuclei to the second group of atomic nuclei and causing the second group of atomic nuclei to undergo a second nuclear reaction and emit energetic particles.

2. The system of claim 1, wherein the first nuclear reaction comprises fusion of some of the atomic nuclei of the first group of atomic nuclei.

3. The system of claim 1 or 2, wherein the ion beam comprises energy in the range of l00 eV to 2000 eV.

4. The system ~~of claim 1~~ according to one of the preceding claims, further comprising a particle detector (502) for detecting the emitted energetic particles.

5. The system ~~of claim 1~~ according to one of the preceding claims, wherein the condensed matter medium is contained within a vacuum chamber (406).

6. The system ~~of claim 1~~ according to one of the preceding claims, wherein the condensed matter medium comprises a Lithium foil and the second group of atomic nuclei comprises Li-6 nuclei.

7. The system of claim 6, wherein the first group of atomic nuclei comprises deuterium (H-2) and protium (H-I) nuclei.

8. The system of claim 7, wherein the emitted charged particles comprise tritium (H-3) and Helium-4 (He-4) nuclei.

9. The system of one of the claims 1 to 8, wherein the first group of atomic nuclei comprises deuterium (H-2) and protium (H-I) nuclei, the second group of atomic nuclei comprises Li-6 nuclei and the first nuclear reaction comprises fusion of the H-2 and H-I nuclei resulting in emission of 5.5 MeV gamma rays and the second nuclear reaction comprises decay of the Li-6 nuclei resulting in emission of energetic particles having an energy of 1.1 MeV.

10. The system of one of the claims 1 to 9, wherein the first group of atomic nuclei comprises deuterium (H-2) and protium (H-I) nuclei, the second group of atomic nuclei comprises Pb-204 nuclei and the first nuclear reaction comprises fusion of the H-2 and H-I nuclei resulting in emission of 5.5 MeV gamma rays and the second nuclear reaction comprises decay of the Pb-204 nuclei resulting in emission of energetic particles having an energy of 7.3 MeV.

11. The system of one of the claims 1 to 10, wherein the first nuclear reaction further emits energetic particles having an energy lower than the energy of the energetic particles that are generated by the second nuclear reaction.

12. A method for generating energetic particles comprising:

generating an ion beam comprising a first group of atomic nuclei;

providing a condensed matter medium comprising a second group of atomic nuclei;

interacting the ion beam with the condensed matter medium so that some atomic nuclei of the first group of atomic nuclei are implanted into the condensed matter medium and undergo a first nuclear reaction thereby releasing a first energy;

wherein the ion beam is further configured to generate high-frequency phonons in the condensed matter medium; and

interacting the high-frequency phonons with the second group of atomic nuclei and affecting nuclear states of the second group of atomic nuclei by transferring the first energy of the first group of atomic nuclei to the second group of atomic nuclei and causing the second group of atomic nuclei to undergo a second nuclear reaction and emit energetic particles.

~~13. The method of claim 12, wherein the first nuclear reaction comprises fusion of some of the atomic nuclei of the first group of atomic nuclei.~~

~~14~~13. The method of claim 12, wherein the ion beam comprises energy in the range of 500eV to 1000 eV.

~~15. The method of claim 12, further comprising providing a particle detector for detecting the emitted energetic particles.~~

~~16. The method of claim 12, wherein the condensed matter medium is contained within a vacuum chamber.~~

~~17. The method of claim 12, wherein the first group of atomic nuclei comprises deuterium (H-2) and protium (H-l) nuclei, the second group of atomic nuclei comprises Li-6 nuclei and the first nuclear reaction comprises fusion of the H-2 and H-l nuclei resulting in emission of 5.5 MeV gamma rays and the second nuclear reaction comprises decay of the Li-6 nuclei resulting in emission of energetic particles having an energy of 1.1 MeV.~~

~~18. The method of claim 12, wherein the first group of atomic nuclei comprises deuterium (H-2) and protium (H-l) nuclei, the second group of atomic nuclei comprises Pb-204 nuclei and the first nuclear reaction comprises fusion of the H-2 and H-l nuclei resulting in emission of 5.5 MeV gamma rays and the second nuclear reaction comprises decay of the Pb-204 nuclei resulting in emission of energetic particles having an energy of 7.3 MeV.~~

~~19. The method of claim 12, wherein the first nuclear reaction further emits energetic particles having an energy lower than the energy of the energetic particles that are generated by the second nuclear reaction.~~

~~20~~14. A system for generating energetic particles comprising:

a condensed matter medium comprising a first group of atomic nuclei and a second group of atomic nuclei;

a phonon generator configured to generate high-frequency phonons in the condensed matter medium; wherein some of the atomic nuclei of the first group undergo a first nuclear reaction thereby releasing a first energy; and

wherein the high-frequency phonons are configured to interact with the first group of atomic nuclei and the second group of atomic nuclei and affect nuclear states of the second group of atomic nuclei by transferring the first energy of the first group of atomic nuclei to the second group of atomic nuclei and causing the second group of atomic nuclei to undergo a second nuclear reaction and emit energetic particles.

~~21~~15. The system of claim ~~20~~14, wherein the first nuclear reaction comprises one of fission, fusion, or radioactive decay.

~~22. The system of claim 1, wherein the energetic particles comprise charged particles.~~