

## INFLUENCE OF ZR-1NB SURFACE STATES ON HYDROGEN SORPTION CHARACTERISTICS

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Zirconium and its alloys are important elements of the nuclear power reactors core. In addition, zirconium has a low neutron capture cross section and good corrosion resistance [1]. However, zirconium parts of reactors are exposed to hydrogenation during operation and hydrogen embrittlement can be destructed. Metal surface is important factor for hydrogen penetration process. For example, surface modification [2] or barrier coatings deposition [3] can prevent hydrogen penetration. However, hydrogen sorption rate should be increased in some cases and coatings of nickel or palladium can be used for it. Nickel has high physical adsorption and chemical activity relative to hydrogen, as well as high permeability for hydrogen [4]. Temperature and hydrogen pressure considerably influence the hydrogen sorption rate. Thus, there is the problem of determining the effect of pre-treatment of the material and the method of hydrogenation parameters on the features of interaction of hydrogen with the alloys. Determination of activation energy of hydrogen sorption before and after coating deposition or surface modification will not only compare different methods of modification, but also provide additional information, which can be used for modeling of hydrogen sorption processes. The objective of this study is to develop methodology for calculating the energy of activation of hydrogen sorption in zirconium alloys with different surface states.

### REFERENCE

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### LIGHTNING ENERGY: PRO ET CONTRA

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Lightning energy, basing on the capture and accumulation of lightning, is still in its infancy. The main problems of lightning energy are mobility of storm fronts and speed of atmospheric electrical discharges, impeding accumulation of energy.

#### Advantages of the atmospheric power are as follows:

- Land and ionospheric supercapacitor constantly recharges using renewable energy sources - solar and radioactive elements of the earth's crust;
- Atmospheric power plant doesn't release pollution into the environment;

- Equipment of weather station is not evident. Balloons are too high to see them with the naked eye. You will need a telescope or binoculars;

- Atmospheric power plant is able to produce energy continuously by maintaining the balls in the air.

**Disadvantages of the atmospheric power are as follows:**

- Atmospheric electricity is difficult to store. It must either be used immediately on site preparation or converted into any other form, such as hydrogen;

- Much discharge of land-ionospheric supercapacitor can upset the balance of the global electric circuit. In this case, the environmental consequences will be unpredictable;

- High voltage electric power in atmospheric systems can be dangerous for staff;

- Balloons are difficult to maintain and support at the desired height. In addition, they can pose a hazard to aviation;

- The total amount of power that can be obtained from the atmosphere is limited. At best, the atmospheric energy can only be a minor addition to other energy sources.

In 2006, the experts working with the satellite NASA “Mission measurement of tropical storms” published data on the number of storms in different regions of the planet. According to the study, it became known that there are areas where up to 70 lightning strikes per year per square kilometer occur.

Lightning is a very unreliable source of energy, because it is impossible to predict in advance when and where a storm will happen.

Another problem is the storm of energy that lightning takes fractions of a second and, as a consequence, it is necessary to store energy very quickly. This requires powerful and expensive capacitors. They may also be used with different vibrational system contours of the second and the third kind, where the load can be coordinated with the internal impedance of the generator.

Lightning is a complicated process divided into several varieties: negative – it is accumulated in the bottom of the cloud and the positive – it is collected in the upper part of clouds. It must also be taken into account when creating a lightning farm.

The company Alternative Energy Holdings Inc. on October 11, 2006 announced the successful development of a prototype model that could demonstrate the possibility of "capturing" lightning to further its transformation into electricity. Lightning is a clean energy, and its application will not only address the numerous environmental hazards, but will also significantly reduce the high cost of energy production. The company also reported that the plant would pay off this for 4-7 years, lightning farm would produce and sell electricity at a price of \$ 0.005 per kilowatt-hour, which is significantly cheaper energy production using contemporary sources.

#### REFERENCES

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