It is expected that further development of lithium batteries will lead to a complete transition of electric cars and increase the share of renewable sources in electricity production, which would significantly reduce greenhouse gas emissions and our dependence on fossil fuels. However, in the near future, lithium resources would be depleted (the percentage of which is very small in the Earth's crust), while the recycling of Li-ion battery components is a long and unprofitable process for now. Therefore, the development in the field of more affordable and safer alternative batteries (based on naturally occurring elements such as sodium, magnesium, aluminum, calcium and zinc) is necessary to at least save lithium from use in less energy-intensive devices, and provide long-term and an alternative for storing electricity produced using renewable sources.

Can li-ion technology be achieved and how can Serbia contribute to that?

Concern for the availability and price of lithium, as well as its impact on the environment, has initiated research in the field of energy storage based on multivalent ions such as calcium (Ca2 +), magnesium (Mg2 +) and aluminum (Al3 +) ions. Multivalent-ion batteries would be a great solution, which would avoid the use of expensive and scarce lithium, reduce the price of the battery, simplify their production and make it safer. For their development, it is necessary to obtain materials that will be able to store a large amount of multivalent ions during the multiple charging and discharging process, and thus have high specific capacities, which would allow such batteries to store a large amount of energy.
In order to respond to these challenges, a team of researchers from three scientific research institutions affiliated with the University of Belgrade (Faculty of Physical Chemistry, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts and Vinca Institute of Nuclear Sciences) gathered through the HISUPERBAT project, funded by by the Science Fund of the Republic of Serbia through the Program for Excellent Projects of Young Researchers (PROMIS). Using innovative approaches based on fundamental knowledge of physical chemistry, primarily electrochemistry, the HISUPERBAT team will develop new and cost-effective high-capacity electrode materials for use in calcium, magnesium or aluminum batteries. In this regard, key issues related to the low storage capacity of multivalent ions of the battery and capacitor electrodes will be addressed.
Further, using the developed battery and capacitor material (which does not contain lithium and cobalt), and the aqueous electrolyte (which contains calcium, magnesium or aluminum salt), the HISUPERBAT team will develop a safe and cost-effective hybrid battery model, which does not contain lithium, as well as flammable and toxic organic electrolyte. The goal

is for the developed model to have the ability to deliver higher specific energy (energy per battery mass) than the corresponding lithium-ion cell and commercial water batteries (lead-acid batteries, nickel-metal hydride and nickel-cadmium batteries).

Expected results

In the short term, the main contribution of the project would be the development of a new generation of energy storage devices, which would have great potential to be produced in Serbia, as a replacement on the market for Li-metal batteries in the form of coins / buttons and / or traditional batteries such as nickel -cadmium (Ni-Cd) batteries (such as those in the remote control), lead (Pb) batteries used in motor vehicles, etc. The developed system would be more environmentally friendly, easier to produce and independent of critical raw materials such as lithium. In the long run, the project could contribute to solving one of the most important issues, and that is environmental pollution. It is expected that the made battery cell would have great future potential, in terms of merging a large number of these cells into “blocks” that could be used in integrated stationary solar energy storage facilities, where the price and safety of the battery are in the foreground. weight is not crucial. The project could be a milestone for the future development of energy storage technology in Serbia.

Source: klima101.rs