Zinc anode material laser treatment as an additional preparation step for improved anode performance

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The world is currently on the brink of major changes that will affect the energy sector in the near future, and how humanity will choose to store the green energy it produces. There are many different energy storage systems that provide the opportunity to store the obtained energy in the long term, and battery technology is one of them. Nowdays, research on rechargeable battery technology is dominated by organic electrolyte batteries containing Li^+, Na^+, and Ca^{2+} ions, but it is not the only technology under investigation. Water electrolyte battery technologies have more supreme properties over organic electrolyte batteries such as higher ion mobility, and better safety, but there are also negative aspects. Research is ongoing to improve the performance of cathode and anode materials. Zn-MnO_2 rechargeable battery technology is one of the possible technologies that could benefit from the use of improved cathode and anode materials.[1-3] Until now, scientists have been trying to improve the cycling performance of this battery pair because they see the possibility of using this battery as a part of a large-scale energy storage system. Therefore, in this work, we have performed the modification of the Zn electrode by laser irradiation to increase the performance of the electrode. In this research, laser radiations of two different wavelengths (266 nm and 1064 nm) were used, and the samples were irradiated in air or water atmospheres. Samples were characterized by Raman spectroscopy, scanning electron microscopy, cyclic voltammetry and impedance measurements. The results show that it is possible to increase the specific surface capacity of the laser-irradiated samples by up to 30%. General results can be seen in Figure 1, where measurements reveal that electrode cycling (ZnO growth and Zn plating) is more efficient and the capacity of the electrode is increased compared to the nonmodified Zn sample.

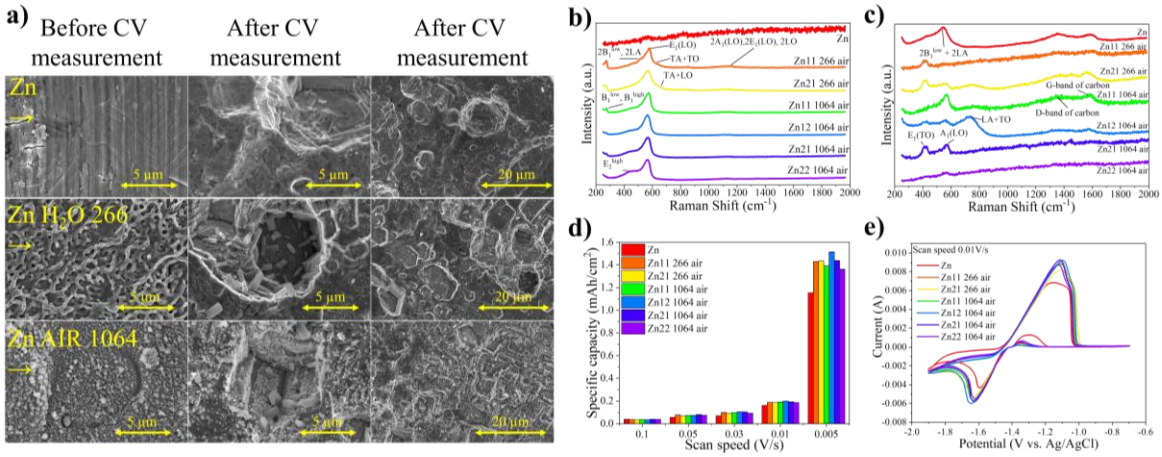

Figure 1: Laser irradiated Zn electrode a) scanning electron mycroscopi images, b) and c) Raman measurements before and after electrochemical measurements d) specific capacity and e) cyclic voltammetry results.

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References

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