NANOSTRUCTURED NICKEL ELECTRODE USING THE TOBACCO MOSAIC VIRUS

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Outline of Project

- Overview
- Description of Microbattery
- Tobacco Mosaic Virus
- Self-assembly and Coating Process
- Research Objective and Methodology
- Results and Conclusion

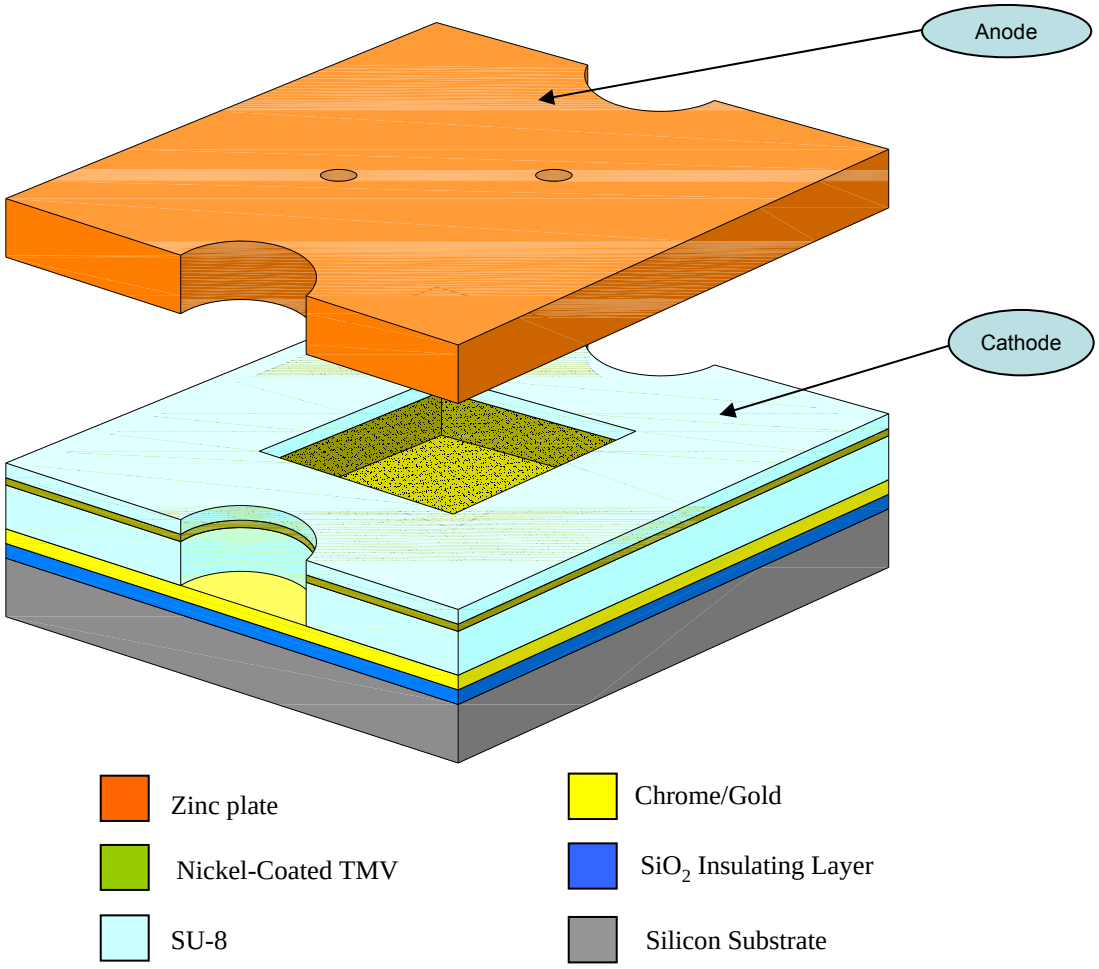
Overview

- Microbatteries are essential in MEMS devices
- The nanostructured nickel electrode is the cathode of the microbattery
- Tobacco Mosaic Virus is used to increase the surface area

Description of Microbattery

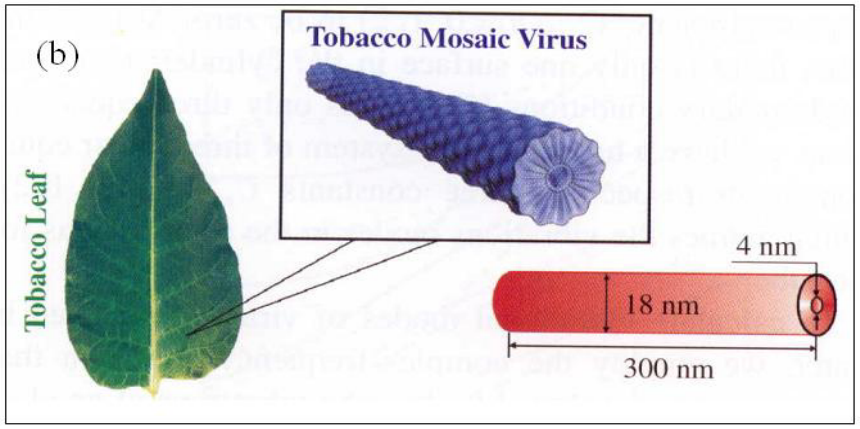
TMV battery showed a six-fold increase in capacity compared to batteries with planar nickel electrodes

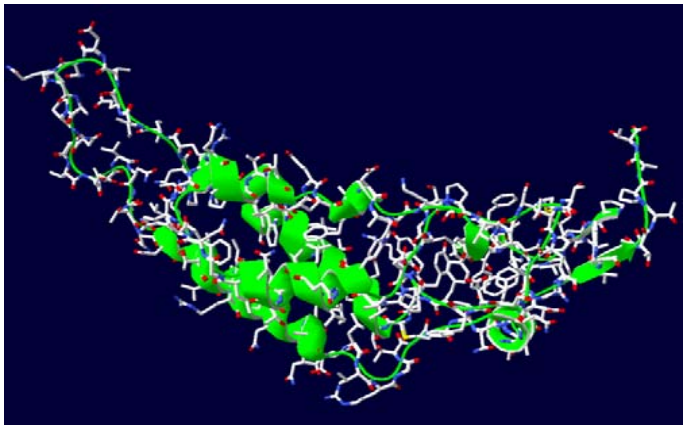
During the testing with the potentiostat, first cycle, capacity was 1.22μAh/cm² and reached 4.45μAh/cm² at the 30th cycle



Tobacco Mosaic Virus

- Renewable in large quantities
- Modifiable to facilitate self-assembly and metallization
- Stable in temperature up to 60˚C
- Resistant to pH (2-10)





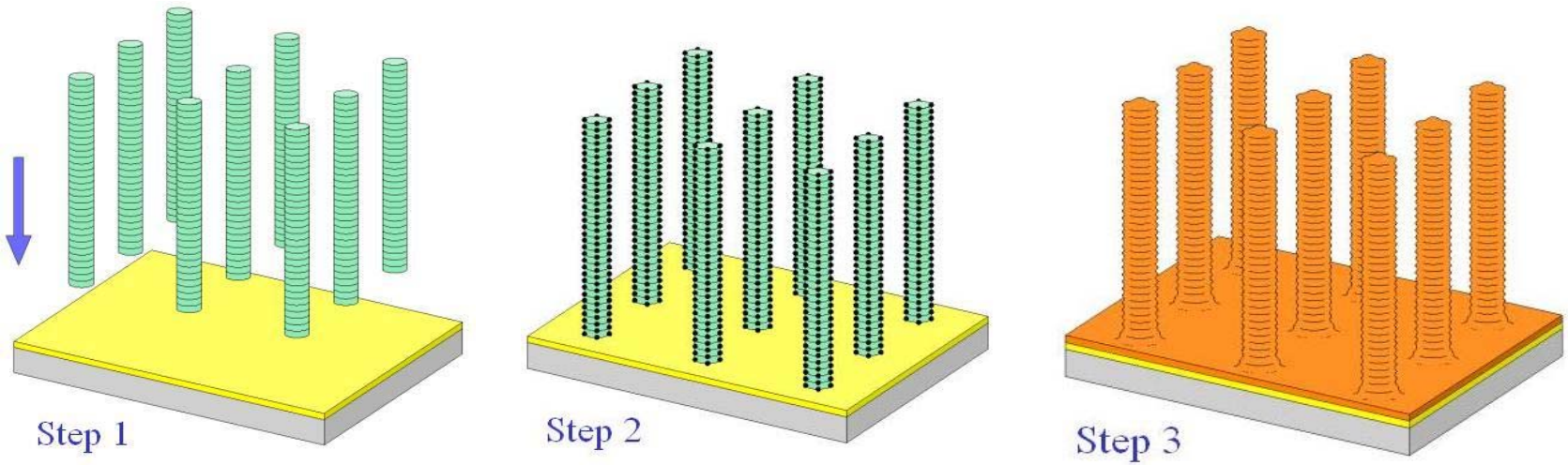
A monomeric unit of the much larger Tobacco Mosaic Virus,(*http://en.wikipedia.org)*

Self-Assembly and Coating Process

Step 1: The gold surface is immersed in a TMV solution during an overnight step. At this point the viruses self assemble on the substrate through the bottom end

Step 2: The virus surface is activated with a palladium catalyst

Step 3: The surface is immersed in an electroless plating solution and nickel is reduced at the palladium catalyzed sites



Research Objective and Methodology

➢The objective of this research is to reduce the time of the biofabrication process with the TMV which takes normally two overnights

• Varying the incubation time of the gold chip in the TMV (step 1) while keeping step two unchanged

• Letting the virus coated gold chip in the Palladium solution (step2) for smaller amounts of time and keeping step one unchanged

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Step 2 Results

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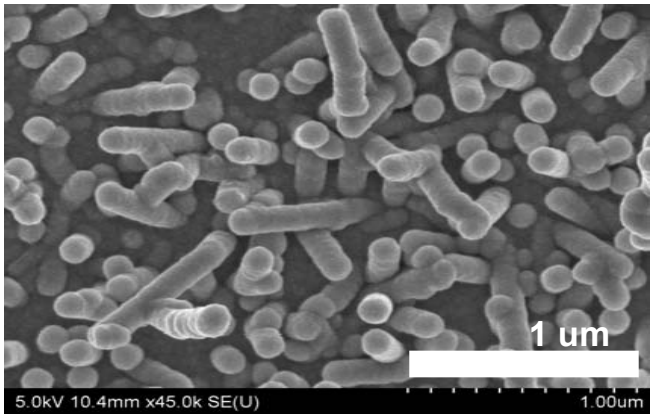
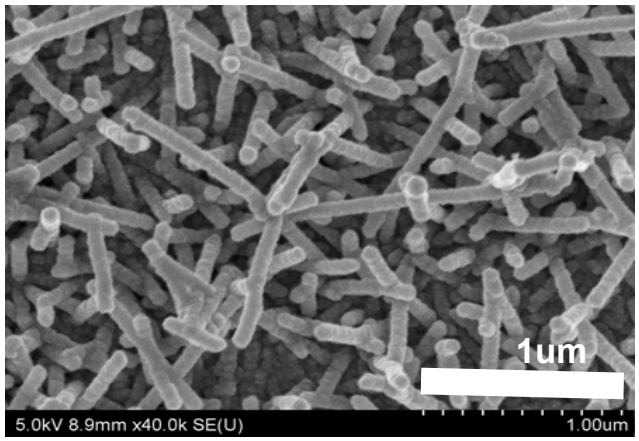
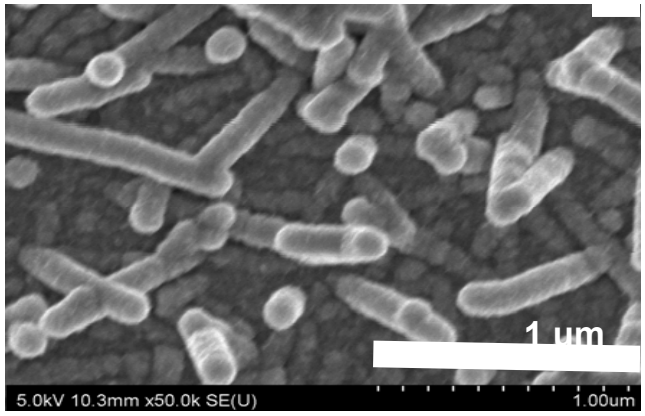
overnight



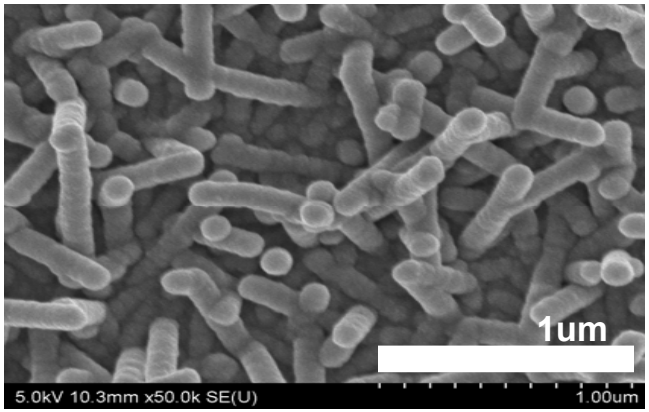
5 hours



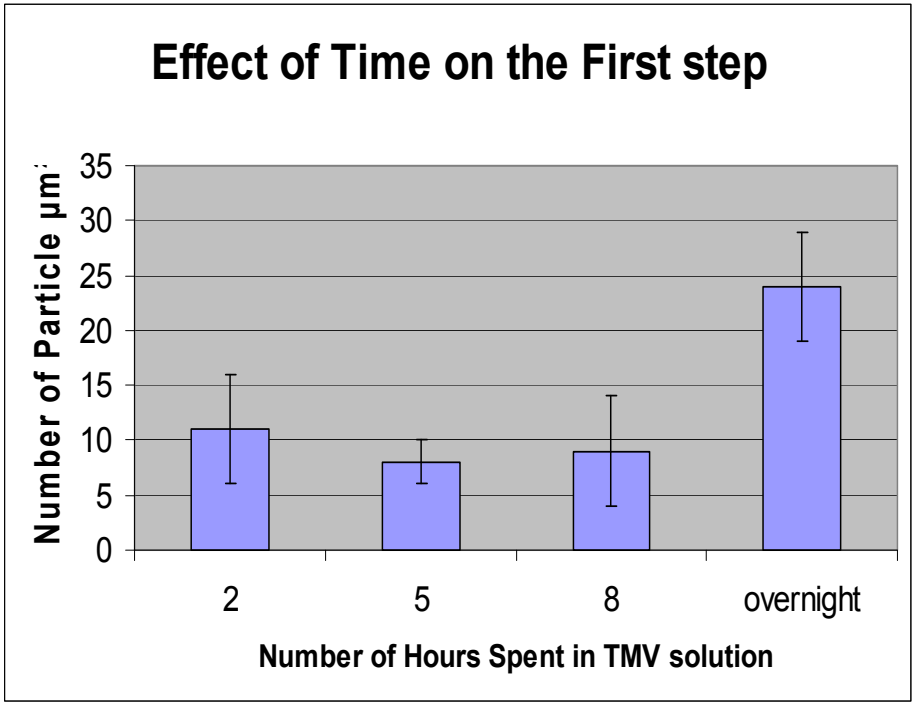
2 hours

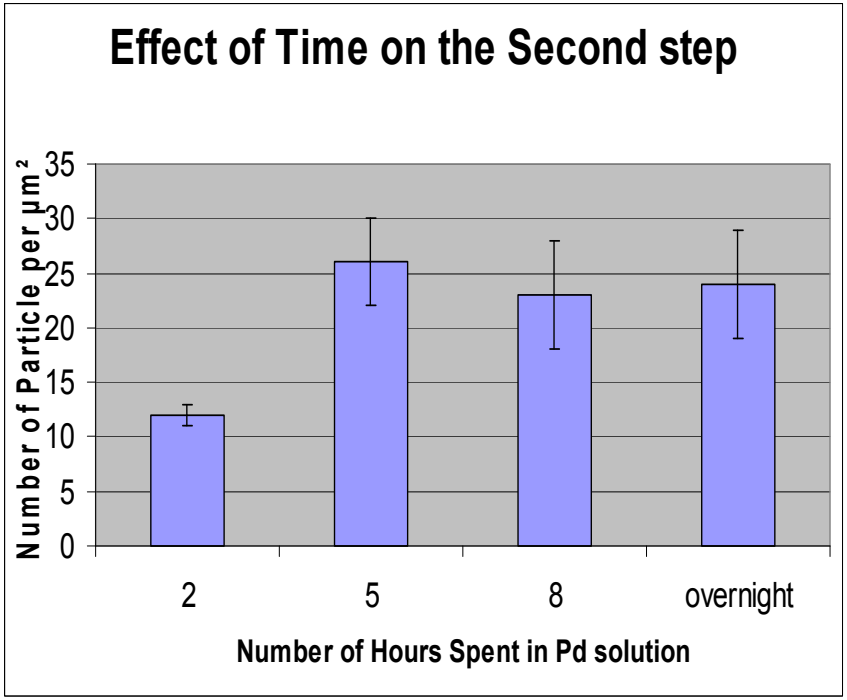


8 hours



Results and Conclusion





CONCLUSION

- The first step has not been optimized. Results obtained so far show that the gold chip needs to spend an overnight in the TMV solution
- Results show that approximately the same number of virus, as well as the same coating is obtained if the second step is reduced to 5 hours

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ANY QUESTIONS?

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THANKS!