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## Simple, efficient nanoparticle synthesis technique uses pulsed underwater spark discharge **FREE**

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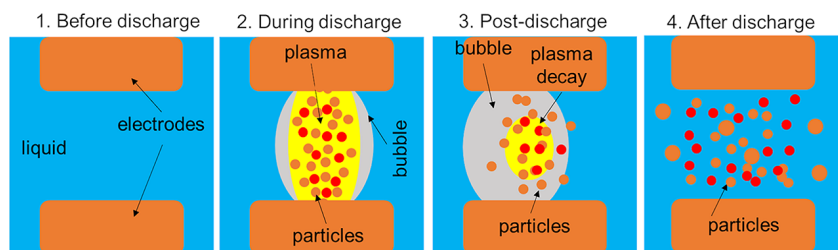
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## Simple, efficient nanoparticle synthesis technique uses pulsed underwater spark discharge

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High throughput method relies on a handful of readily available components and produces a large number of homogeneous nanoparticles in solution.



Although nanomaterials have attracted significant research interest in many different fields, many nanoscale synthesis techniques are costly and complex. Thomas Merciris, Flavien Valensi and Ahmad Hamdan present a simple, low-cost method for producing nickel and cobalt oxide nanoparticles using underwater spark discharges.

The team suspended electrodes made of nickel and cobalt in a deionized water bath and applied pulsed voltages up to 20 kV across them to generate a plasma spark. In the high temperature and pressure environment of the spark plasma, small pieces of the anode and cathode break off to form nanoparticles. The short lifetime of the spark allows for efficient synthesis and high throughput.

The group investigated Co-Co, Ni-Ni and Co-Ni electrode pairings and found the majority of nanoparticles were produced by the sharp anode, rather than the blunt cathode. The produced particles were primarily composed of either Co or Ni and their oxides, with little evidence of Co-Ni alloy formation.

While producing the nanoparticles was straightforward, characterizing them was more difficult.

“As we produced a large number of particles, we need to ensure the selectivity of the products, in terms of size distribution and chemical composition,” said Hamdan.

To address this issue, the team used a combination of transmission electron microscopy, which provides high resolution images of a small sample of particles, and UV-visible absorption spectroscopy, which characterizes a large number of particles in solution, giving their size distribution and optical properties.

The researchers plan to continue to develop their method and hope to produce nanoparticles made of other metals, dielectrics and nanoalloys.

**Source:** “Synthesis of nickel and cobalt oxide nanoparticles by pulsed underwater spark discharges,” by Thomas Merciris, Flavien Valensi, and Ahmad Hamdan, *Journal of Applied Physics* (2021). The article can be accessed at <https://doi.org/10.1063/5.0040171>.

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