



Multi-Material AM to Fabricate Bi-Polar Plates (BPP) for Electrochemical Systems



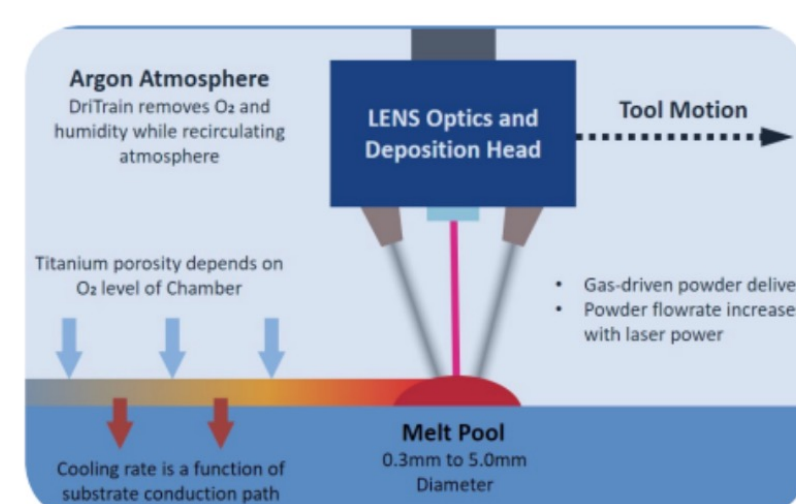
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Overview

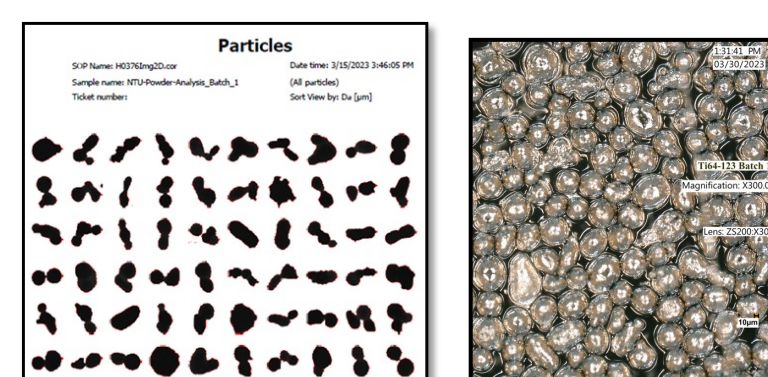
Bi-polar plates provide electrical conduction between cells and physical strength to the fuel cell stack.

Direct Energy Deposition (DED) uses a laser, electron beam or plasma/electric arc as a heat source to melt metal powder through nozzles or wire feeding directly at a point on the substrate. **Can we use DED to fabricate metal BPPs?**



Accomplishments

Powder Analysis



Batch 1

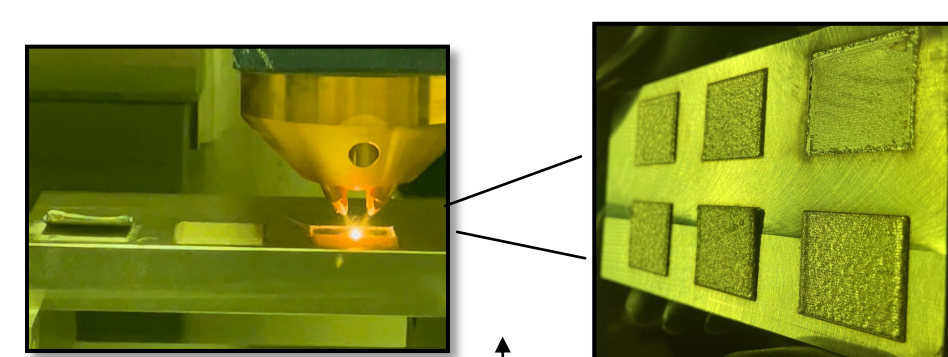
4 scopes of 1/8 tsp of Ti64-123
of particles tested: 43,547
Diameter:
($D_a > 45 \mu\text{m}$) & ($D_a < 150 \mu\text{m}$) 99.42%
Sphericity: (Sphericity > 0.9) 66.24%

3D Microscope



Before
Sample 7A before and after grinding and polishing. Although different Magnification were used before and after voids were visible in sample.

DED Results



Ti64-123 was able to Adhere to stainless steel Substrate from 275W to 325W. Hatch spacing: 0.15 in/min. Rounds per minute (RPM): 5



My Name is Deirdra Deswood. I am from Round Rock, Arizona. I am of Navajo descent and a first-generation college student. I major in industrial engineering and mathematics.



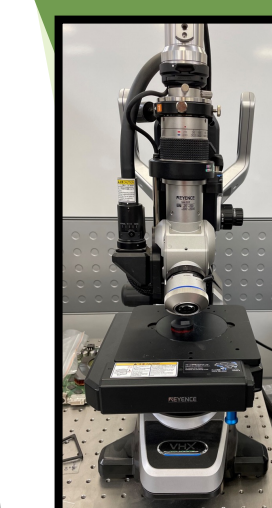
Hello, I am Winter Morgan. I attend Navajo Technical University. I major in Industrial Engineering.

Equipment



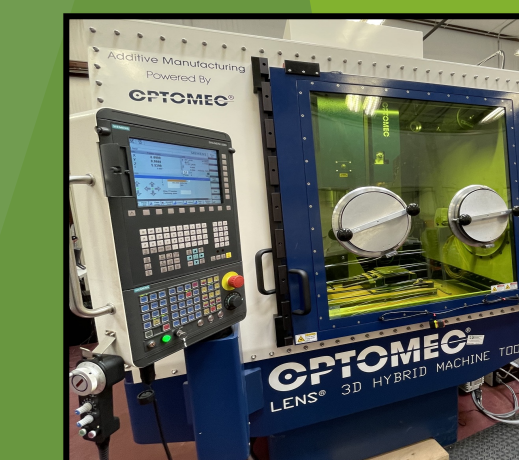
(a)

Picture a. Particle Size Analyzer...



(b)

Picture b. Keyence VHX 6000 3D Microscope.



(c)

Picture c. Optomec® MTS 500 hybrid (DED)

Future Work

- Probe samples using microscope/XCT: porosity and surface quality
- Print a single layer SS with a single layer titanium (or titanium alloy) on top. Desired thickness < 200 microns.
- LANL to evaluate samples and compare with traditionally manufactured BPPs
- Measure corrosion properties of samples
- Investigate the addition of coatings on the sample properties

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Our Goal: To continue to learn more about energy-related research

