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Title: Chemical Applications for Enhanced World Security

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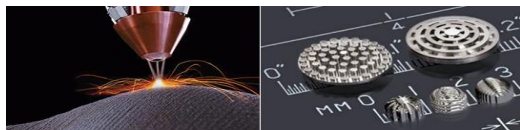
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BACKGROUND

- Samples for chemical analysis generally require extensive preparation *before* analyses can be performed.
- Processing time long.
- Requires significant expertise.
- LANL has developed sample processing methods for nuclear materials analysis that is fast for use by non-experts.
- New LANL methods can be performed in 3D printed devices controlled electronically.
- This integration of chemistry within 3D printed devices would be a “chemical application” for a specific analysis.



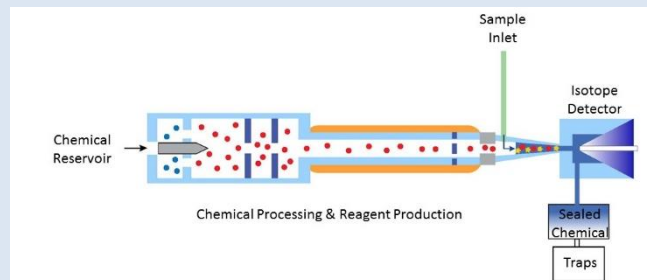
3D printing or additive manufacturing produces parts that could not be made before.

MOTIVATION

- Reduce complexity of chemical analysis by combining chemical and physical processing steps into one package.
- Develop instrumentation that cost less and is easy to use in a field laboratory by non-experts.
- Develop this “Chemical Application” so uranium enrichment can be measured on-site, eliminating the need for radioactive sample transport.

INNOVATION

Development of chemical processing inlet for isotope ratio mass spectrometry (IRMS) of uranium isotopes in corrosive uranium hexafluoride (UF_6).



Chemical processing steps integrated into additively manufactured inlet for IRMS of in UF_6 .

Instrumentation for Isotope Ratio Measurement



Conventional Laboratory Instrumentation

- \$1M - 1,600 lbs.
- Radioactive Sample Shipment to laboratory
- Expert User Operation

Field Laboratory Instrumentation

- \$30K -40 lbs.
- No Sample Shipment
- Transparent Operation

ANTICIPATED IMPACT

- Simplification of international treaty compliance monitoring of uranium enrichment.
- Will enhance world security.
- Reduce instrumentation cost by more than 30 times.
- Eliminate need for highly skilled operator.

PATH FORWARD

- Develop business plan for manufacturing start-up.
- Develop chemical analysis applications for:
 - Nuclear Materials
 - Homeland Security
 - Environment
 - Industrial Process Monitoring

Technology Readiness Level

- TRL 3
- TRL 8 within two years.

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