

Targets for FRIB

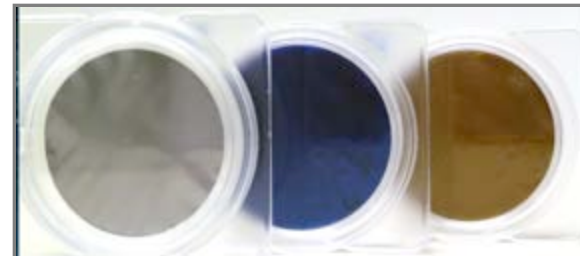
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Facility for Rare Isotope Beams
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Target Lab Working Group

- What can we hope to accomplish? We can begin with the generalization that for the physics undertaken with these rare beams at Coulomb energies, thin films and foils will be necessary – using both stable isotopes and thin radioactive targets. For fast beams, thick targets will be required as well. Other demands might include stripper foils, degraders, target backing foils, detector windows, etc. So, let's set out to answer the following questions:
- What kind of targets and applications will be needed for FRIB?
 - * Thin foils and films
 - * Thick targets for fast beams
 - * Stripper foils
 - * Foils for detector windows and gas cells
- How and where will these demands be met?
 - * Dedicated target lab as a part of the FRIB complex
 - * Expand upon facilities already established at MSU
 - * Another location as "Lead Target Lab"
 - * Commercially available opportunities
- Manpower **(Riley)**



Targets for FRIB

Physics with fast beams

Physics techniques near the Coulomb barrier

Proton Rich:- Forming exotic compound nuclei in heavy-ion fusion needs exotic isotopic targets and beams.

Thin, ($\mu\text{g}/\text{cm}^2$ to mg/cm^2) rare isotopes

Neutron Rich:-

Inverse direct reactions

Protonated, deuterated, tritiated plastics/metals

Thin-windowed gas cells (d, t, ^3He , ^4He)

Inverse Coulomb excitation

A variety of thin isotopic foils ^{12}C to ^{238}U

β -decay studies

A variety of thin isotopic catchers/degraders ^{12}C to ^{238}U

Z



N



Targets for FRIB

Radioactive Targets (Loveland)

Heavy Elements:- Th,U,Pu,Cm,Cf targets for “hot fusion” with neutron-rich FRIB beams.

Tritiated Targets:- Tritiated Plastics, Titanium, Palladium.

Special sources:- Special geometry (extended), strong, weak.

Windows, Wedges and Degraders

Channel Plate foils:- Formvar $\sim 5\text{mg}/\text{cm}^2$ metalized with MgO, AlO etc

Ion Chamber, PPAC windows:- Thin mylar, plain and metalized.

Degraders:- Many metals (Ti, Ni, Mo, Au especially), many thicknesses.

Z Polarized Targets (Galindo-Uribarri)

Cryogenic Targets (Mittig)

Strippers (Marti)

N

A Way Forward

- MSU Capabilities **(Yurkon)**
- Enhance MSU infrastructure to prepare targets foils.
 - Advantage: Local can lead to fast response
 - Advantage: Local can lead to flexibility

MSU Position – “No current plans to expand the target making however, a future expansion could be part of the FRIB Operating Budget.”

- ANL Capabilities **(Greene)**
- Enhance the ANL infrastructure for target production.
 - Advantage: Can service the stable beam community too
 - Advantage: Can develop from our deep experience base.
 - Advantage: Radioactive target / source facility exists.

ANL Position - Propose to become “lead target lab” for FRIB (thin) targets, radioactive targets, specialized sources, train new target specialists, modernize the facilities, etc.



A Way Forward

- **Funding Proposal (ANL/DOE) to enhance/upgrade the target facilities;**
- Enhance the workforce
 - New Tech: For routine foils / degraders / shipping
 - New Target Scientist: For developing new methods
- New Equipment
 - Electron beam evaporator
 - Equipped with a high temperature thermal source
- Enhance the Infrastructure
 - Remove two aging evaporators from Target Lab
 - Rebuild H-Wing Actinide/Source Laboratory to enhance production.
- Training/Networking
 - Teaching a new generation in target preparation techniques.
 - Act as a “clearinghouse” for needed capabilities found elsewhere (INTDS).
- **IMPORTANT: We need support from FRIB Community & S.A.C.**

