

DARTMOUTH COLLEGE

MANGANESE-ALUMINUM-BASED MAGNETS

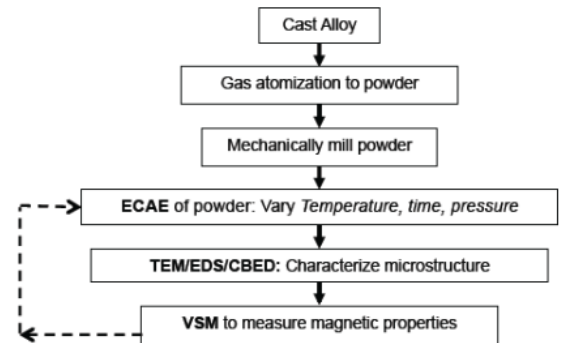
PROJECT TITLE:	Nanocrystalline τ -MnAl Permanent Magnets		
ORGANIZATION:	Dartmouth College	LOCATION:	Hanover, NH
PROGRAM:	REACT	ARPA-E AWARD:	\$397,433
TECH TOPIC:	Vehicle Technologies & Renewable Energy	PROJECT TERM:	1/1/12 – 12/31/12
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/REACT.aspx		

CRITICAL NEED

Rare earths are naturally occurring minerals with unique magnetic properties that are used in electric vehicle (EV) motors and wind generators. Because these minerals are expensive and in limited supply, alternative technologies must be developed to replace rare-earth-based magnets in motors and generators. Alternatives to rare earths will contribute to the cost-effectiveness of EVs and wind generators, facilitating their widespread use and drastically reducing the amount of greenhouse gases released into the atmosphere.

PROJECT INNOVATION + ADVANTAGES

Dartmouth is developing specialized alloys with magnetic properties superior to the rare earths used in today's best magnets. EVs and renewable power generators typically use rare earths to turn the axles in their electric motors due to the magnetic strength of these minerals. However, rare earths are difficult and expensive to refine. Dartmouth will swap rare earths for a manganese-aluminum alloy that could demonstrate better performance and cost significantly less. The ultimate goal of this project is to develop an easily scalable process that enables the widespread use of low-cost and abundant materials for the magnets used in EVs and renewable power generators.



IMPACT

If successful, Dartmouth's project would result in a permanent magnet that contains no rare earth minerals and could help power a renewable power generator or an EV motor as well as any of today's best commercial magnets.

- **SECURITY:** The U.S. produces a small fraction globally of industrial rare earths. Developing alternatives to the use of rare earths has potential to reduce our dependence on these materials and will have a positive impact on our national economic and energy security.
- **ENVIRONMENT:** The transportation and electric power sectors account for nearly 75% of U.S. greenhouse gas emissions each year. Better magnets would support the widespread use of EVs and wind power, significantly reducing these emissions.
- **ECONOMY:** The U.S. spends nearly \$1 billion per day on imported petroleum. Improvements in magnet technology would enable a broader use of EVs, which would help insulate our economy from unexpected spikes in the price of oil.
- **JOBS:** Construction and manufacturing of renewable power facilities and EVs could create tens of thousands of jobs by 2030.

CONTACTS

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