Advanced Research Projects Agency • ENERGY

REACT PROJECT

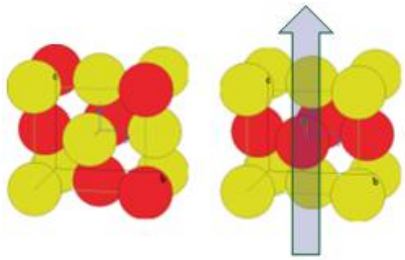
NORTHEASTERN UNIVERSITY

IRON-NICKEL-BASED SUPERMAGNETS

PROJECT TITLE:	Multiscale Development of $L1_0$ Materials for Rare Earth-Free Permanent Magnets		
ORGANIZATION:	Northeastern University	LOCATION:	Boston, MA
PROGRAM:	REACT	ARPA-E AWARD:	Finalizing Contract
TECH TOPIC:	Vehicle Technologies & Renewable Energy	PROJECT TERM:	Finalizing Contract
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

Northeastern University will develop bulk quantities of rare-earth-free permanent magnets with an iron-nickel crystal structure for use in the electric motors of renewable power generators and EVs. These materials could offer magnetic properties that are equivalent to today's best commercial magnets, but with a significant cost reduction and diminished environmental impact. This iron-nickel crystal structure, which is only found naturally in meteorites and developed over billions of years in space, will be artificially synthesized by the Northeastern University team. Its material structure will be replicated with the assistance of alloying elements introduced to help it achieve superior magnetic properties. The ultimate goal of this project is to demonstrate bulk magnetic properties that can be fabricated at the industrial scale.

IMPACT

If successful, Northeastern University's meteorite-inspired magnets would contains no rare earth minerals and could help power a renewable power generator or an EV motor better than 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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