



U.S. Department of Energy Categorical Exclusion Determination Form

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Proposed Action Title: (0472-1595) University of Minnesota - Synthesis, New Composition and Phase Stabilization of Body Center Tetragonal (BCT) Fe-Based Nanocomposite Magnet – A Path to Fabricate Rare Earth Free Magnet

Program or Field Office: Advanced Research Projects Agency - Energy

Location(s) (City/County/State): Minneapolis, MN; Oak Ridge, TN

Proposed Action Description:

Funding will support development of a high-energy density bulk iron nitride (Fe16N2) permanent magnet material capable of replacing rare earth elements in permanent magnets that are used in wind turbine generators and electric vehicle motors. University of Minnesota's application was selected for an initial 18-month period (Phase I) of funding. The ARPA-E Program Director may decide to negotiate and fund project activities for an additional 18-month period (Phase II) after evaluating the work performed in Phase I. ARPA-E has not obligated funds or negotiated a scope of work for Phase II at this time. Accordingly, this categorical exclusion determination covers only the activities that will occur in Phase I.

Proposed work consists of indoor, laboratory-based research and development (R&D) and computer modeling, including (1) experimental exploration of new composition and stress effects and Fe16N2 stabilization; (2) theoretical analysis of Fe16N2 and other Fe-N compounds through computer modeling and non-collinear spin formalism; (3) development of a scalable nanoparticle deposition source to fabricate a nanocomposite type exchange-spring Fe16N2 magnet prototype; (4) development of a cold crucible method to fabricate bulk Fe16N2 magnetic wires; (5) gas phase nitridation of Fe-base precursor nanoparticle powders to develop a prototype Fe16N2 bonded magnet; (6) in-situ post-annealing and HR-electron microscopy characterization of Fe16N2 nanoparticles, thin films, and magnets; and (7) conducting a polarized neutron reflectivity study of Fe16N2 thin films, nanoparticles, and magnets.

Indoor, laboratory-based R&D and computer modeling will be performed in dedicated laboratory and computing facilities at the University of Minnesota (Minneapolis, MN) and Oak Ridge National Laboratory (Oak Ridge, TN).

Categorical Exclusion(s) Applied:

A9 - Information gathering, analysis, and dissemination

B3.6 - Small-scale research and development, laboratory operations, and pilot projects

For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, including the full text of each categorical exclusion, see Subpart D of 10 CFR Part 1021.

Regulatory Requirements in 10 CFR 1021.410(b): (See full text in regulation)

The proposal fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D.

To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal.

The proposal has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

Based on my review of the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer:

Date Determined: 12/12/2011