



National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

NSF 11-089

Dear Colleague Letter: Designing Materials to Revolutionize and Engineer our Future (DMREF)

The National Science Foundation (NSF) through the Mathematical and Physical Sciences (MPS) and Engineering (ENG) Directorates, is excited to bring to your attention a new national materials initiative entitled *Materials Genome Initiative for Global Competitiveness*.¹ The Materials Genome Initiative (MGI) recognizes the importance of materials science to the well-being and advancement of society and aims to "deploy advanced materials at least twice as fast as possible today, at a fraction of the cost." The national initiative integrates all components in the materials continuum, including materials discovery, development, property optimization, systems design and optimization, certification, manufacturing and deployment, with each employing the toolset developed within the materials innovation infrastructure. The toolset integrates synergistically advanced computational methods with data-enabled scientific discovery and innovative experimental techniques in such a manner as to revolutionize our approach to materials research and engineering.

NSF will support this initiative through well-coordinated activities spearheaded jointly by the Divisions of Materials Research (DMR) in MPS and Civil, Mechanical, Manufacturing Innovation (CMMI) and Chemical, Bioengineering, Environmental and Transport Systems (CBET) in ENG. Of interest to NSF are activities that accelerate materials discovery and development by building the fundamental knowledge base needed to progress towards designing and making a material with a specific and desired function or property from first principles. Also of interest to NSF are proposals that seek to advance fundamental materials understanding across length and time scales to elucidate the effects of microstructure, surfaces, and coatings on the properties and performance of engineering materials. The ultimate goal is to enable control of material properties through design via the establishment of the interrelationships between constitution, processing, structure, properties, performance and process control. It is anticipated that many proposed efforts will bridge program and divisional interests and that these will be coordinated, co-reviewed and funded by the programs and divisions as appropriate. The proposed research must be a collaborative and iterative process where computation guides experiments and theory, while experiments and theory advance computation. Designs should include consideration of recyclability and sustainability of materials. While not required, ties with industry, national laboratories, engineering partners or other organizations are encouraged. If there are strong collaborations with industry, please see the Grant Opportunities for Academic Liaison with Industry (GOALI) program solicitation, which can be used in conjunction with this effort.² Future funding opportunities within the Software Infrastructure for Sustained Innovation solicitation also may be of interest.³ Because this MGI approach emphasizes a more integrated approach to materials research, cross-disciplinary educational activities are encouraged, as are public outreach activities.

The complexity and challenge of activities addressed by this initiative require a transformative approach to the discovery and development of new materials, optimization and / or prediction of properties of materials, and informing the design of material systems. Success in the initiative requires a collaborative, synergistic approach between theory, computation and experiments. Therefore, as part of our strategy to support the initiative, the divisions invite proposals based on MGI principles in FY 12; an activity named Designing Materials to Revolutionize and Engineer our Future (DMREF). DMREF is not a stand-alone program. DMREF proposals must be submitted to DMR, CMMI or CBET in accordance with the applicable submission window 15 January to 15 February 2012. The title of the proposal should begin with "DMREF."

Participants interested in submitting proposals are strongly encouraged to first contact one of following program officers: DMR, Mary Galvin (mgalvind@nsf.gov), Linda Sapochak (lsapocha@nsf.gov), Daniele Finotello (dfinotel@nsf.gov) or Diana Farkas (dfarkas@nsf.gov); CMMI, Clark Cooper (ccooper@nsf.gov), Glaucio Paulino (gpaulino@nsf.gov), or Mary M. Toney (mtoney@nsf.gov); and CBET Ashok Sangani (asangani@nsf.gov).

We are excited by the opportunities created by the national Materials Genome Initiative and the contribution made to it by this joint venture.

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¹ Materials Genome Initiative for Global Competitiveness
http://www.whitehouse.gov/sites/default/files/microsites/ostp/materials_genome_initiative-final.pdf

² Grant Opportunities for Academic Liaison with Industry (GOALI)
http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf10580

³ Software Infrastructure for Sustained Innovation (SI2)
http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf11539