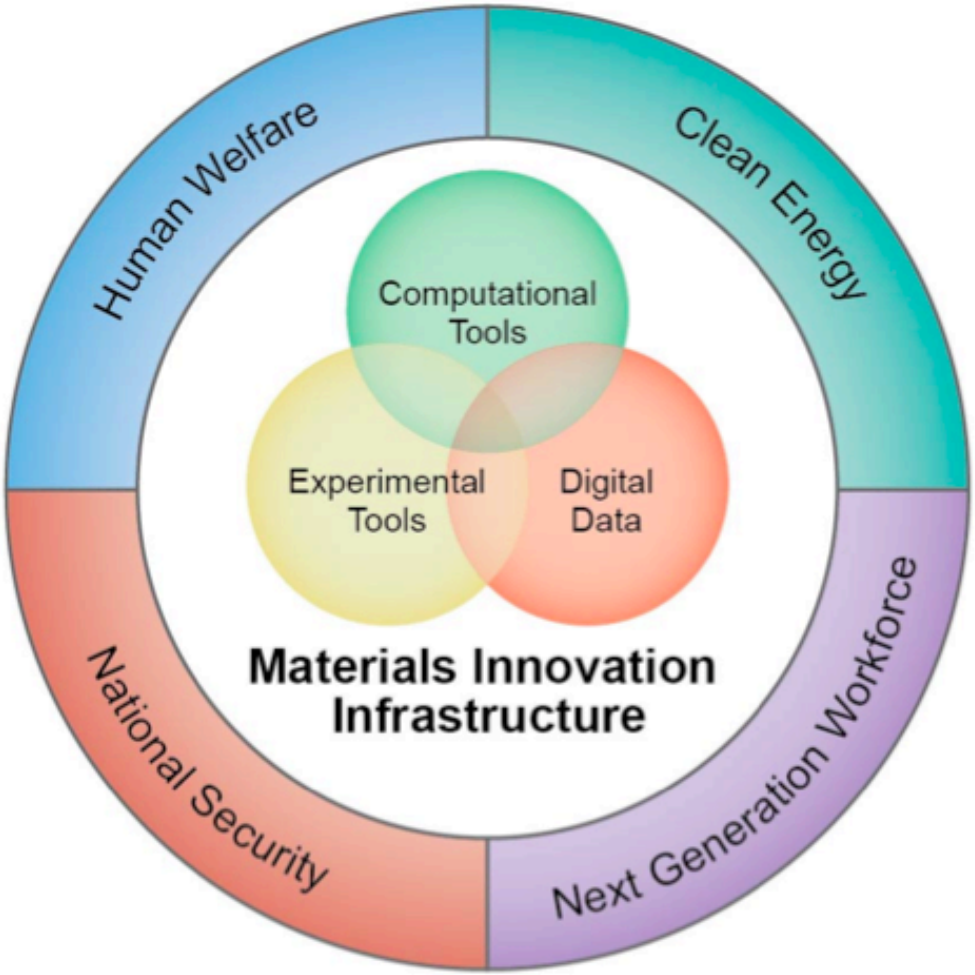
Discussion of Materials Genome Initiative



Challenges

1. The tools (data bases and software) must have broad accessibility for success.
2. Experimental programs must be integrated with modeling and simulation throughout all phases of the initiative.
3. It will be necessary to change the way that engineers are educated. Materials engineers must think about components, design engineers must consider the incorporation of developing materials in components. The broader group of engineers must recognize that materials of construction need not have uniform properties, and can be manipulated locally through the control of structure.
4. Materials informatics is poorly developed at this time; available knowledge of materials must be archived and available for use by all.
5. Multifunctional materials capabilities must be captured in the design of components.
6. The design process must also recognize the complexity of modern materials requirements for durability, compatibility, joining, integration, and reuse.
7. The development of verification, validation and uncertainty quantification will be required.
8. Students will have to be educated in the area of innovation.
9. High throughput, automated, low-cost experiments will be needed to generate the appropriate data.
10. Computationally driven experimental design will be required to generate benchmark data.

Observations

Through their leadership of materials education programs, the UMC is responsible for transforming the educational program in materials.

Because products and devices can not be made without materials, MSE is the key discipline that bridges science and engineering.

The Materials Genome initiative is important not only to education, but to economy and national security.

The solutions of inverse problems will be important to realize the vision articulated by the materials genome.

What the UMC can do to support the MGI

1. We will engage the engineering education administrations in our universities and other academic units to lead this new approach to innovation.
2. The next generation of engineering leaders and innovators will have to understand the challenges and payoffs of the MGI and we will incorportate modules throughout the curriculum. In particular, the capstone design course should be taught from this perspective.
3. We will incorporate manufacturing perspectives in the curriculum.
4. This will be a central focus of UMC activities; last year we had a workshop on this topic and there has been a lot of activity in our community for several years. We will invest our resources, leveraging interactions professional societies. Our interaction with TMS links us to traditional industries and our interaction with MRS links us to emerging industries.
5. Provide visibility for this initiative within the Universities.
6. Many members of the UMC are from industry and many departments have industrial advisory boards. We will use these links to engage industry.
7. We are willing to advocate the MGI to elected officials and others.
8. UECC (collection of materials societies) will coordinate interactions with industry.

Proposed actions

We will work with TMS to populate the ICME educational repository.

We will generate a proposal to NSF to fund the development ICME educational modules and a web basedrepository.

We will organize a second workshop on the Materials Genome initiative that will be broader than ICME.

We will support the continued organization of the summer school in ICME (K. Thornton)