

Materials Genomics: From CALPHAD to Flight

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The numerical implementation of established materials science principles in the form of purposeful engineering tools has brought a new level of integration of the science and engineering of materials. Building on a system of fundamental databases now known as the Materials Genome, parametric materials design has integrated materials science, applied mechanics and quantum physics within a systems engineering framework to create a first generation of designer "cyberalloys" that have now entered successful commercial applications, while the DARPA-AIM initiative has broadened computational materials engineering to address acceleration of the full materials development and qualification cycle. Integration with the full suite of fundamental databases and models has demonstrated the historic milestone of greatly accelerated flight qualification for two aircraft landing gear steels. In support of the national MGI, the new NIST-sponsored CHiMaD Center for Hierarchical Materials Design expands the scope of genomic materials design across materials classes.