Physical properties of high-entropy alloys

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Within the past decade, a new approach to metallic alloys design with multiple principal elements in near-equimolar ratios, termed high-entropy alloys (HEAs), has been proposed. According to this concept, a high entropy of mixing can stabilize disordered solid solution phases with simple structures like a body-centered cubic (bcc), a face-centered cubic (fcc) and a hexagonal close-packed (hcp) with small unit cells, in competition with crystalline intermetallic phases. HEA structure is characterized by a topologically ordered lattice with an exceedingly high chemical (substitutional) disorder and can be conveniently termed as a "*metallic glass on an ordered crystal lattice*". HEAs exhibit interesting physical-mechanical properties like high hardness, solid solution strengthening, superconductivity, perfect magnetic softness and complex magnetic phase diagrams. HEA materials show good potential for the use in electronic, magnetic and magnetocaloric applications.