

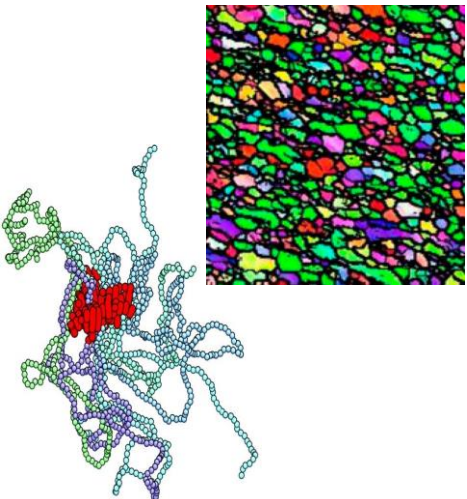
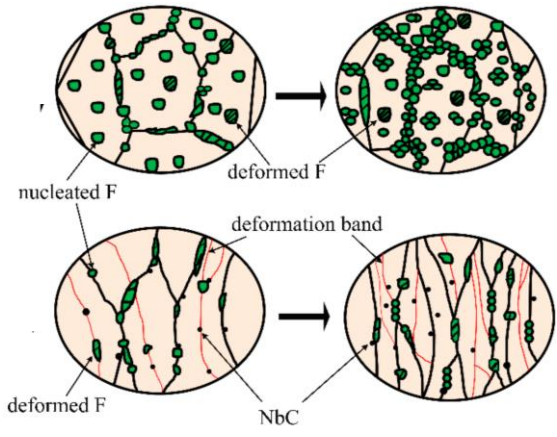
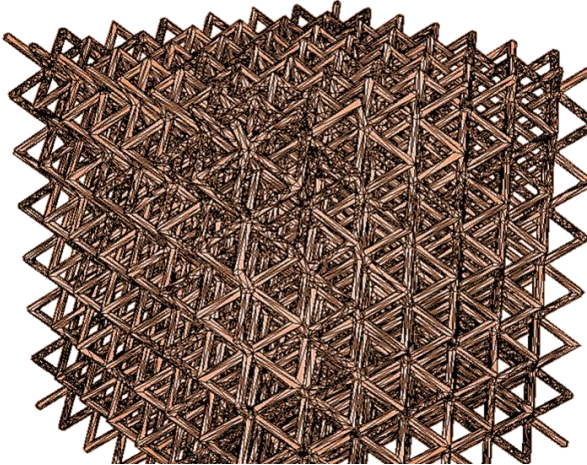

Image: Design-Relevant Level Definitions for Structured Materials

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Design perspective on structured material (SM) levels

Natural material	<i>Source of Dominant Properties</i>		Structure and processing
			
Sub-microstructure	Microstructure	Mesostructure	Macrostructure
<ul style="list-style-type: none"> ❑ Natural material structure on atomic, crystal, or molecular level ❑ May be influenced by processing conditions ❑ Examples: Polymer chains, grain structure details in metals 	<ul style="list-style-type: none"> ❑ Structure observable using an optical microscope, heavily influential on macro-scale properties ❑ Strongly influenced by processing conditions ❑ Examples: Porosity, metal grain layout, scan structure in 3-D printed materials 	<ul style="list-style-type: none"> ❑ Designed or patterned structure, may be generated by element layout or designed inclusions/defects/voids ❑ Solid, homogeneous materials do not have a mesostructure ❑ Examples: Honeycomb structure, metamaterial, unit cell-based lattice 	<ul style="list-style-type: none"> ❑ In design, typically the “useful level” ❑ Generally the final component or product that is to be made from the designed material ❑ For homogeneous solid materials, microstructure drives macrostructure properties (no mesostructure)

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