00F_Overview of Length Scales

•We build models that relate the performance of materials, as measured with physical specimen in the laboratory, to the atomistic structure of the materials.

•The laboratory measurements are displayed in terms of variables (for example strain as a function of time at high temperature). These graphs describe the phenomenological properties of the material.

•The structure of materials is represented by different length scale from the size of the atoms (sub-nanometer) to the size of the grains (or crystallites) in a polycrystal (typically micrometer), size of particles used in sintering, to the size of flaws (tens of micrometers or greater).

•The objective of building models is to link the length scales that define the material to the phenomenon measured in the laboratory.

•In this way the models serve an engineering and design function, i.e. how the structure can be changed to improve performance. For example they can lead to the role of the particle size in the sintering process, which has great practical significance.