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EXPLORING LENGTH SCALE-PROPERTY RELATIONSHIPS IN DENSE NANOCRYSTALLINE MATERIALS.

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Key Words: CAPAD, Nanocrystallinity,

The influence of nano-scale defects (grain/phase boundaries, pores, etc) can be significantly different from micro-scale features. We will discuss how interfaces in nanocrystalline materials interact with light (phonons) and heat (phonons) and how precise control of these defects can be used to tune materials properties. We will start by discussing how current activated pressure assisted densification (CAPAD) can be leveraged to produce dense nanocrystalline samples by effectively overcoming the grain growth challenge. In particular the effect of the relevant processing parameters, pressure, time and temperature on grain sizes will be presented and density will be presented. We will present experimental as well as modeling results on property-nanostructure relationships. In particular we will concentrate on light transparency in the visible range and thermal conductivity.