High performance metals offer tremendous potential to improve energy efficiency and system performance for numerous applications. However, conventional processing methods have reached certain limits in further improving the properties of metals. Nanoparticles can be used to further improve the performance of light metals. Unfortunately, there is a long standing challenge in nanoparticle dispersion and stabilization in molten metals, preventing mass solidification processing of bulk super metals containing populous nanoparticles. Here we show a newly discovered mechanism of nanoparticle self-dispersion and stabilization to achieve a uniform self-dispersion of high loading nanoparticles in various molten metals to deliver unprecedented properties for Super Metals, such as strength, stiffness, plasticity and high temperature stability. This talk will specifically discuss our recent progress on super metals produced by solidification processing and laser additive manufacturing. This approach of Super Metals paves a revolutionary way to enhance the performance of all metals to meet energy and sustainability challenges in today’s society.

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