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Fan et al.

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(54) **TUNING AND SYNTHESIS OF METALLIC NANOSTRUCTURES BY MECHANICAL COMPRESSION**

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CPC ... **B01J 8/00** (2013.01); **B05D 3/12** (2013.01); **B22F 1/0018** (2013.01); **B22F 2202/00** (2013.01); **B22F 2301/255** (2013.01); **B82Y 30/00** (2013.01); **B82Y 40/00** (2013.01)

(58) **Field of Classification Search**

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See application file for complete search history.

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(57) **ABSTRACT**

The present invention provides a pressure-induced phase transformation process to engineer metal nanoparticle architectures and to fabricate new nanostructured materials. The reversible changes of the nanoparticle unit cell dimension under pressure allow precise control over interparticle separation in 2D or 3D nanoparticle assemblies, offering unique robustness for interrogation of both quantum and classic coupling interactions. Irreversible changes above a threshold pressure of about 8 GPa enables new nanostructures, such as nanorods, nanowires, or nanosheets.

11 Claims, 16 Drawing Sheets

