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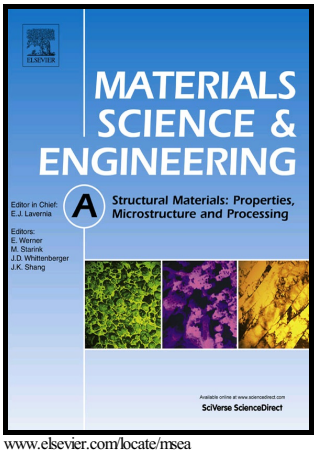

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Microstructure evolution and superior tensile properties of low content Graphene nanoplatelets reinforced pure Ti matrix composites

X.N. Mu [a], H.M. Zhang [a*], H.N. Cai [a], Q.B. Fan [a], Z.H. Zhang[a], Y. Wu[a], Z.J. Fu [a], D.H. Yu [a]

[a]National Key Laboratory of Science and Technology on Materials under Shock and Impact, School of Materials Science and Engineering, Beijing Institute of Technology, Beijing 100081, China

Abstract: Titanium matrix composites with the discontinuous reinforcement of graphene nanoplatelets (GNPs) were produced by powder metallurgy and subsequent hot-rolling. In the process of spark plasma sintering (SPS), the GNPs were well preserved at low temperature and high compressive pressure. Hot-rolling process was applied to improve the microstructure and properties of the GNPs-Ti matrix composites. The GNPs were uniformly distributed and arranged along with the rolling direction (RD). Also, the GNPs blocked slipping so that the matrix generated $\{10\bar{1}1\}$ $<10\bar{1}\bar{2}>$ compressive twining to be compatible with deformation in the rolling process with the increase of GNPs content. Tensile strength test demonstrated an excellent ultimate tensile strength that was 54.2% higher than pure titanium with merely 0.1wt% GNPs addition. The strengthening mechanism of composites was discussed by three main strengthening factors combined with a modified load transfer model and it was thought that the composites were strengthen by grain refinement, load transfer from Ti matrix to GNPs and texture strengthening.