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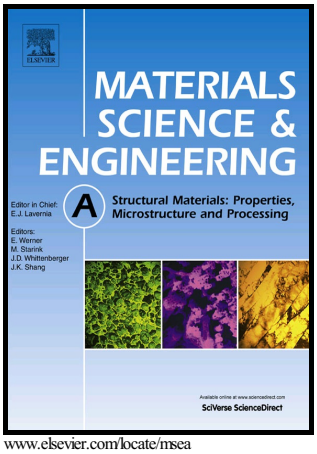

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Abstract:

A high ductility and extra strain hardening are achieved in Al alloy but without strength improvement via the introduction of a gradient nanostructured layer. The strain gradient and different residual stress between gradient layer and matrix are mainly responsible for the enhanced ductility, while the appearance of minority flaws (grain boundary precipitations) accounts for strength change. Compressive residual stress suppresses crack nucleation and propagation and cooperatively activates the partial dislocation mechanism in gradient layer. Combined with tensile residual stress from matrix, strain gradient is further increased during tensile testing. Besides, samples with the gradient layer exhibit significant thickness effect on the tensile properties, due to varying compressive residual stress occurring at flaws. Different contributions from

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