

# A MECHANISM-BASED STRAIN GRADIENT PLASTICITY THEORY WITHOUT THE HIGHER-ORDER STRESS

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Based on the Taylor dislocation model, we have developed a strain gradient plasticity without the higher-order stress. The equilibrium equations and boundary conditions in this new theory are the same as those in classical plasticity theories. It is shown that the difference between this new theory and the prior strain gradient plasticity theory involving the higher-order stress is within a thin boundary layer of the solid. We have also used this strain gradient plasticity theory to study several experiments at the micron and sub-micron scales, such as micro-bend, micro-torsion, micro-indentation hardness, and particle-reinforced composite materials.