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Ductility of metal alloys with grain size distribution in a wide range of strain rates VLADIMIR V. SKRIPNYAK, NATALIYA V. SKRIPNYAK[1], EVGENIYA G. SKRIPNYAK, National Research Tomsk State University — Ductility of ultrafine grained (UFG) metal alloys with a distribution of grain size was investigated in wide loading conditions by numerical simulation. The multiscale models with a unimodal and a bimodal grain size distributions were developed using the data of structure research of hexagonal close packed and face center cubic UFG alloys. Macroscopic fracture is considered as a result of the formation of percolation clusters of damage at the mesoscopic level. The critical fracture strain of UFG alloys on the mesoscale level depends on the relative volumes of coarse grains. The nucleation of damages at quasi-static and dynamic loading is associated with strain localization in UFG partial volumes with bimodal grain size distribution. The concentration of damages arise in the vicinity of the boundaries of coarse and ultrafine grains. The occurrence of a bimodal grain size distributions causes the increase of UFG alloys' ductility, but decrease of their tensile strength.

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