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This Week's Citation Classic

Ansell G S & Weertman J. Creep of a dispersion-hardened aluminum alloy.
Trans. Met. Soc. AIME 215:838-43, 1959.
[Dept. Metallurgical Engineering, Rensselaer Polytechnic Inst., Troy, NY and US Office of Naval Research, American Embassy, London, England]

The creep behavior of a dispersion-hardened aluminum-aluminum oxide alloy in both the fine-grained, as-extruded and coarse-grained, recrystallized condition was investigated. The results of this study together with a dislocation model derived to predict the steady-state creep behavior of coarse-grained dispersion-hardened alloys are presented. [The *SCI*® indicates that this paper has been cited in over 105 publications since 1961.]

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"In 1957, I was a naval officer who had just been transferred from sea duty to the US Naval Research Laboratory (NRL). At NRL I was assigned to the metal physics consultant staff and began work on neutron damage studies in permanent magnet materials. In the same research group, a colleague, Johannes Weertman, had recently published his now classic dislocation models[1,2] describing the high temperature steady-state creep behavior of pure metals and single-phase alloys. In casual conversation, I asked whether he had considered extending the creep models to two-phase alloys. Although at that point I knew little about creep theory, I had just recently completed a master's thesis[3] at Rensselaer with Fritz Lenel studying the microstructure of an unusual two-phase alloy system: a dispersion-hardened aluminum-aluminum oxide alloy. The structure of this alloy was extremely stable at high temperatures and, therefore, particularly well suited for creep studies. For this reason, this alloy system offered a unique opportunity for a fundamental study of the creep behavior of dispersion-hardened alloys.

"We quickly agreed to get started. Lenel provided the alloy specimens, both in the fine-grained, as-extruded and coarse-grained, recrystallized conditions for the experimental studies. The dislocation model derived to describe the steady-state creep behavior of coarse-grained dispersion-hardened alloys followed directly from the earlier single-phase theory.[1,2] The coarse-grained, recrystallized alloy was more creep resistant than expected, showing no measurable steady-state creep. Therefore we had no experimental comparison for the behavior predicted from the creep model.

"Shortly after completing this work, both Weertman and I left NRL—he to the Office of Naval Research in London and then later to Northwestern University and I to return to Rensselaer to undertake my doctoral program. As part of my doctoral dissertation, I confirmed the predictions of the dislocation model[4] by examining a less creep resistant dispersion-hardened alloy, and, by extending the creep theory to its stress limit, derived a model[5] to predict the yield strength of dispersion-hardened alloys.

"I expect that this paper has been extensively cited because it contained the first steady-state creep theory and experimental creep data for what was, and has remained for some time, a scientifically and technologically important class of materials, dispersion-strengthened alloys.

"I was awarded the Hardy Gold Medal of the AIME in 1961 and the Curtis W. McGraw Award of the ASEE in 1971 largely as a result of my work on dispersion-hardened alloys. I owe much to Weertman who introduced me to 'model making' as well as to our supervisors at NRL, the late E.I. Salkovitz and A.I. Schindler, who encouraged both of us, and to Lenel, my thesis adviser and, for many years, a deeply respected colleague."

1. Weertman J. Theory of steady-state creep based on dislocation climb. *J. Appl. Phys.* 26:1213-17, 1955.
2. ——————. Steady-state creep through dislocation climb. *J. Appl. Phys.* 28:362-4, 1957.
3. Lenel F V, Ansell G S & Nelson E C. Metallography of aluminum powder extrusions. *Trans. Met. Soc. AIME* 209:117-24, 1957.
4. Ansell G S & Lenel F V. Creep of a recrystallized aluminum SAP-type alloy. *Trans. Met. Soc. AIME* 221:452-6, 1961.
5. ——————. Criteria for yielding of dispersion-strengthened alloys. *Acta Metallurgica* 8:612-16, 1960.

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