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# Homogenized elastic-viscoplastic behavior of plate-fin structures at high temperatures

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## Summary

In this study, homogenized elastic-viscoplastic behavior of plate-fin structures fabricated for compact heat exchangers is investigated. First, the homogenized behavior is numerically analyzed using a fully implicit mathematical homogenization scheme of periodic elastic-inelastic solids. A power-law creep equation is assumed to represent the viscoplasticity of base metals at high temperatures. The plate-fin structures are thus shown to exhibit significant anisotropy as well as compressibility in both the elastic and viscoplastic ranges of the homogenized behavior. Second, a non-linear rate-dependent macroscopic constitutive model is developed by utilizing the quadratic yield function proposed for anisotropic compressible plasticity. The resulting constitutive model is shown to be successful for simulating the anisotropy, compressibility and rate-dependency in the homogenized behavior in multiaxial stress states.

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