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Creep and stress relaxation induced by interface diffusion in metal matrix composites[1] YINFENG LI, ZHONGHUA LI, Shanghai Jiao Tong University — An analytical solution is developed to predict the creep rate induced by interface diffusion in unidirectional fiber-reinforced and particle reinforced composites. The driving force for the interface diffusion is the normal stress acting on the interface, which is obtained from rigorous Eshelby inclusion theory. The closed-form solution is an explicit function of the applied stress, volume fraction and radius of the fiber, as well as the modulus ratio between the fiber and the matrix. It is interesting that the solution is formally similar to that of Coble creep in polycrystalline materials. For the application of the present solution in the realistic composites, the scale effect is taken into account by finite element analysis based on a unit cell. Based on the solution, a closed-form solution is also given as a description of stress relaxation induced by interfacial diffusion under constant strain. In addition, the analytical solution for the interface stress presented in this study gives some insight into the relationship between the interface diffusion and interface slip.

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Yinfeng Li
Shanghai Jiao Tong University

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