Abstract Submitted
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An alternative to Mie-Grüneisen[1] WILLIAM ANDERSON, Los Alamos National Laboratory — The Mie-Grüneisen thermal equation of state is probably the most-used EOS form in high-pressure physics, because of its simplicity and the fact that it provides a reasonable description of the thermal energy while keeping the overall EOS analytic. However, use of the Grüneisen parameter, γ, places restrictions on forms that can be used for the specific heat, while the volume dependence often ascribed to γ can be too simplistic. These shortcomings complicate attempts to realistically include explicit temperature dependence in models. I suggest an alternative using the Einstein thermal model with a correction term. The Einstein characteristic temperature θ can be obtained as a function of volume using the bulk modulus and Poisson ratio. Combination with any analytic and differentiable cold curve formulation results in a complete analytic EOS with volume and temperature as the natural independent variables. In the case of the quasiharmonic approximation with negligible electronic or magnetic thermal energy terms, internal energy or pressure can replace temperature as the second independent variable while maintaining analyticity. Use of this model is restricted to temperatures above 0.39θ, where the Einstein and Debye specific heats are quantitatively similar.

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