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The impact of non-Fickian diffusion on entropy production in a simple model[1] T. DEBORDE, A.S. WARE, University of Montana — Recent theoretical work has suggested that the standard model of Fickian diffusion is not appropriate for inhomogeneous systems [B. Ph. van Milligen, *et al.*, Eur. J. Phys. **26**, 913 (2005)]. As an alternative, van Milligen *et al.* suggested a Fokker-Planck diffusivity law. The flux from Fick's law is given by $\Gamma(x,t) = -D(x,t)\,\partial n(x,t)/\partial x$ while the flux from the Fokker-Planck diffusivity law is $\Gamma(x,t) = -\partial\left[D(x,t)\,n(x,t)\right]/\partial x$. In this work, a simple model is used to analyze the effect of the two different diffusivity laws on the production of entropy. Three cases are considered: (1) the spatial dependence of the diffusivity is due solely to a density-dependent diffusivity, $D = D_0 n^{\alpha}$; (2) an arbitrary spatial dependence in the diffusivity, $D = D(x)$; and (3) a coupled density and temperature model with both the diffusivity and the conductivity as functions of the density and temperature, $D = D_0 n^{\alpha 1} T^{\alpha 2}$ and $\chi = \chi_0 n^{\alpha 3} T^{\alpha 4}$. Analytic and numerical results for each of these cases will be presented with a focus on the transport and production of entropy.

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