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Sinopsis

Models for the mechanical behavior of porous media introduced more than 50 years ago are still relied upon today, but more recent work shows that, in some cases, they may violate the laws of thermodynamics. In The Thermophysics of Porous Media, the author shows that physical consistency requires a unique description of dynamic processes that involve porous media, and that new dynamic variables-porosity, saturation, and megascale concentration-naturally enter into the large-scale description of porous media. The new degrees of freedom revealed in this study predict new dynamic processes that are not associated with compressional motions.

The book details the construction of a Lorentz invariant thermodynamic lattice gas model and shows how the associated nonrelativistic, Galilean invariant model can be used to describe flow in porous media. The author develops the equations of seismic wave propagation in porous media, the associated boundary conditions, and surface waves. He also constructs the equations for both immiscible and miscible flows in porous media and their related instability problems.

The implications of the physical theory presented in this book are significant, particularly in applications in geophysics and the petroleum industry. The Thermophysics of Porous Media offers a unique opportunity to examine the dynamic role that porosity plays in porous materials.
