Gibbs Paradox and Stability of Porous Structure

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When *Maurice A. Biot* developed the theory of fluid mixtures and stability of porous media, he recognized the difficulties posed by the Gibbs Paradox. Three of his papers are closely related to the resolution of Gibbs Paradox [1-3]. He is also well-known for the work on variational principles in thermodynamics [4]. When a porous medium is subjected to thermodynamic studies, "containers" of the fluids must be considered as part of the system under study, but thermodynamics treat the fluid (gases, liquids or solutions) body as the concerned system. The heat engine system considered in thermodynamics does not include the container. What is worse, Gibbs Paradox [5] states that the separation of the porous medium to form a bulky fluid phase and a pure bulky solid phase would not lead to any change in thermodynamic parameters; these two structures are of the same stability, which, intuitively, must be wrong. Recently carried out active studies on Gibbs Paradox [6-8] shed some light on this fundamental problem and, if agreed and accepted, the conclusions can be used as a theoretical foundation to study the stability of porous structures.

Keywords: information theory, entropy, deformation, mixing, separation (demixing)

References and Notes

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