Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Scaling fields and the nature of liquid-gas asymmetry in fluids JINGTAO WANG, University of Maryland, CLAUDIO CERDEIRIÑA, Universidad de Vigo, Spain, MIKHAIL ANISIMOV, JAN SENGERS, University of Maryland — Fisher and coworkers [Phys. Rev. Lett. **85**, 696 (2000); Phys. Rev. E **67**, 061506 (2003).] recently suggested that in fluids the two theoretical scaling fields, commonly known as "ordering" and "thermal", are mixtures of three physical fields, namely, chemical potential, temperature, and pressure. We have examined experimental consequences of this formulation ("complete scaling") with regard to the asymmetry of vapor-liquid coexistence in real fluids. By analyzing the coexisting curves of various fluids, we have shown that the vapor-liquid asymmetry originates from two different sources: one from mixing of chemical potential and pressure into the thermal field and another one from mixing of pressure into the ordering field. The first source is attributed to a correlation between entropy and density, whereas the second source is associated with the excluded volume. Real fluids can be mapped into the symmetric lattice-gas (Ising-like) model by a redefinition of the order parameter that can be now expressed through a combination of density, entropy, and molar volume. We have also demonstrated which molecular parameters of fluids control these two sources of vapor-liquid asymmetry.

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Date submitted: 28 Nov 2005 Electronic form version 1.4