

# Rigorous Properties of a Continuous System in the High Activity Region

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Received December 18, 1973

**Abstract.** The original idea of Ruelle, to associate classes of configurations of the continuous Widom and Rowlinson model to contours on a lattice, is exploited to get for this model an expression of the grand partition function very similar to that of the Ising system. This allows to get, when the activities are high enough, a microscopic description of this system as a mere transcription of Minlos and Sinai analysis of the Ising model at low temperatures.

## Introduction

In the past decade Minlos and Sinai [1, 2], using the original idea due to Peierls [3] of contours on a lattice were able to derive a set of integral equations à la Kirkwood and Saltzburg for the “contour correlation functions” and get a very detailed microscopic description for a large class of lattice systems of the Ising type when the temperature is sufficiently low.

The aim of this paper is to show how it is possible to extend the methods of Minlos and Sinai and their results to the case of a continuous system: the Widom and Rowlinson model. Such a model [4] is a classical continuous system with two kinds of particles, A and B, in which there is a hard-core repulsion of range  $R$  between unlike particles and no interaction between like particles.

Recently Ruelle [5], associating classes of (A–B)-particle configurations to sets of closed contours on a lattice, was able to prove the existence of a phase transition, when the activities of the two species of particles are equal and high enough.

Starting from the same geometrical description, we get, with a suitable definition of subensembles of contours (the chains), an ex-