Ground states of lattice gas models on the triangular and honeycomb lattices: devil's step and quasicrystals

Yu.I. Dublenych

Institute for Condensed Matter Physics of the National Academy of Sciences of Ukraine, 1 Svientsitskii Str., 79011 Lviv, Ukraine, E–mail: dubl@ph.icmp.lviv.ua

I propose a method for determining the ground states of lattice gas (or Ising) models. The method makes possible to find all types of ground states, including chaotic and ordered-but-aperiodic ones, and to identify the first order phase transitions between them. Using this method, I prove the existence of an infinite series of ground states (the so-called "devil's step") in the lattice gas model on the triangular lattice with up to third nearest-neighbor interactions and I study the effect of the interactions up to 19-th neighbors on this series. To my best knowledge, this is only the second example of the devil's step at zero temperature in the lattice gas models with one kind of particles.