LJ "6-12" fluid	2D	3D	4D	5D
T_Z	2	4	8	20
$n_b \sigma^d$	0.91	0.965	1.342	2.54
T_B	1.56	3.418	9.01	40.4

TABLE I: The results of computation of T_Z and T_B for LJ potential (18) for different dimensions and the packing factor $n_b \sigma^d$.

The locus of the CP is obtained easily according to (29) and (31) (see Fig. 1,2). The comparison with the results of the simulations is in Table II. Note that expressions (29) and (31) allow to clarify the fact noted in [20] about different characters of the dependencies of T_c and n_c on the dimensionality d. The value T_c strongly depends on the dimension because of the dependence of T_B while the d-dependence of n_c is rather weak.

Note that nonmonotonic dependence of the critical density on the number of dimensions d can be interpreted in terms of the proposed isomorphism as follows. The equilibrium interparticle distance for the LJ potential (18) is $r_0 = \sigma \, 2^{1/6}$ and can be considered as the spacing of the cubic lattice for the LG. The effective radius r_{eff} of excluded volume occupied by the particle from the physical point of view can be defined by the obvious energetic condition:

$$\Phi(2r_{\text{eff}}) = T \quad \Rightarrow \quad r_{\text{eff}}(T) . \tag{32}$$

So the packing of spheres of radii r_{eff} on the corresponding cubic lattice can be found as

$$\eta(T, d) = \frac{2^{d/6} \, \sigma^d}{V(d) \, r_{\text{eff}}(T)^d} , \tag{33}$$

where $V(d) = 2 \frac{\pi^{d/2}}{\Gamma(\frac{d}{2})}$ is the volume of the unit ball in d dimensions. Obviously n_c depends on $\eta(T, d)$ monotonically. The dependence of $\eta(T, d)$ on the dimension d is shown on Fig. 2 by grey lines and shows the minimum in the interval $d \leq 4$ in dependence on the temperature. Note that at $T = 0$, when $r_{\text{eff}} = \sigma$ this minimum reaches exactly at $d = 4$.

The existence of global isomorphism also provides the explanation of the fact about the cubic form of the binodal for real molecular fluids. The fact that the shape of the binodal is almost cubic and characterized by the effective exponent $\beta_{eff} = \frac{\partial \ln \varphi}{\partial \ln \tau} \approx 1/3 , \varphi = \frac{n_l - n_g}{n_c}$ in a wide temperature interval for the system with short range interactions was discovered long ago by J. E. Verschaffelt [21–23] (see also [6]) and since then has been confirmed by

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