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Erratum: Polymer chains with excluded volume: Critical exponents from free energy optimization [J. Chem. Phys. 101, 4268 (1994)]

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We evaluate the critical exponents ν and θ appearing in the equations:

$$\langle r_j^2\rangle \propto j^{2\nu}; \quad W(\mathbf{r}_j)\propto r_j^{\theta}\exp[-D(r_j/\langle r_j^2\rangle^{1/2})^{\delta}],$$

where $\langle r_j^2\rangle$ is the mean-square distance between chain atoms separated by j bonds and $W(\mathbf{r}_j)$ is the assumed Domb–Gillis–Wilmers probability distribution. The reported result $\nu=0.604$, $\theta=0.312$ is incorrect and is to be replaced by $\nu=0.593$, $\theta=0.372$, as we are going to show.

We shall quote in parentheses a few equations of the paper. The source of the error is a misinterpretation of Eq. (2.14) (p. 4270); whereas the correct excluded-volume parameter β is $\propto(\bar{r}/l)^{3+\theta}$, this being the proportionality factor of the contact probability between any two chain atoms, the same factor was incorrectly taken as $\propto(\bar{r}/l)^3$ on the seemingly plausible argument that β should be proportional to the volume of the sphere with radius $\bar{r}$ (the smallest distance between two atoms). As a consequence we have the following changes, where the arrow separates the incorrect version from the correct version:

Eq. (2.17) (p. 4270): $\quad 6(2\nu-1)\Rightarrow 2(3+\theta)(2\nu-1);$

Eq. (5.19) (p. 4274): $\quad 2\nu-1=(3+\theta)/[3/(5+\theta)]\Rightarrow 2\nu-1=1/(5+\theta);$

Eq. (5.24) (same page): $\quad 2\theta^2+9\theta-3=0\Rightarrow\theta^2+5\theta-2=0,\ \ \theta=0.372;\ \ \nu=2/(3+\theta)=0.593.$

We remark that the resulting figure of ν is in much better agreement with the exact value for an open chain ($\nu=0.588...$)[1] than the previous incorrect figure $\nu=0.604$.

[1] J. C. Le Guillou and J. Zinn-Justin, Phys. Rev. Lett. **39**, 95 (1977).

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