Erratum: "Influence of an electric field on the non-Newtonian response of a hybrid-aligned nematic cell under shear flow" [J. Chem. Phys. 126, 204905 (2007)]

A. David Guillén and Carlos I. Mendoza[a)]
Instituto de Investigaciones en Materiales, Universidad Nacional Autónoma de México, Apartado Postal 70-360, 04510 México, Distrito Federal, Mexico

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We incorrectly calculated the first normal stress difference (note that this same error was committed in Refs. 1 and 2, that we took as the basis of our calculation) as $N_1 \equiv \sigma_{xx} - \sigma_{zz}$, with σ_{ii} the components of the *viscous stress tensor* given by Eq. (5) of Ref. 3. This is incomplete since it only gives the contribution to N_1 due to viscous effects. However, in the Leslie-Ericksen theory, the *total stress tensor* is the sum of the viscous stress [Eq. (5) of Ref. 3], an isotropic pressure, and the Frank distortional stress, given by[4,5]

$$\sigma^d_{jk} \equiv -\left(\frac{\partial F_d}{\partial n_{i,j}}\right) n_{i,k}, \tag{1}$$

where $n_{i,j} \equiv \partial n_i / \partial x_j$, and F_d is the Frank-Oseen free energy density [Eq. (12) of Ref. 3] plus a contribution due to body forces. In our system, assuming the equal elastic constant approximation the only nonzero component of σ^d_{jk} is

$$\sigma^d_{zz} = -\frac{K}{l^2}\left(\frac{d\theta}{d\varsigma}\right)^2, \tag{2}$$

and therefore, the first normal stress difference is given by

$$N_1[\theta(\varsigma)] = -\frac{|v_0|}{2l} \sin 2\theta(\alpha_1 \cos 2\theta + \alpha_2 + \alpha_3)\frac{d\tilde{v}_x}{d\varsigma} + \frac{K}{l^2}\left(\frac{d\theta}{d\varsigma}\right)^2. \tag{3}$$

Correspondingly, the discussion and conclusions of the section related to N_1 are modified. In Fig. 1 we plot N_1 versus ς for (a) $q=0$ and (b) $q=20$. As we can see, N_1 takes only positive values for all shear rates and is asymmetrical with respect to the direction of shear. In Fig. 2, we plot N_1 versus ς for (a) $m=20$, (b) $m=0$, and (c) $m=-20$. Under the action of the electric field, N_1 tends to vanish near the lower plate and to increase near the upper plate. Also, note that in the case $m=0$ and $q=0$, there is a constant positive value of N_1 which means that the distortional stress due to the conflicting anchorage of the HAN cell produces a force between the plates even in the absence of flow and applied electric field.

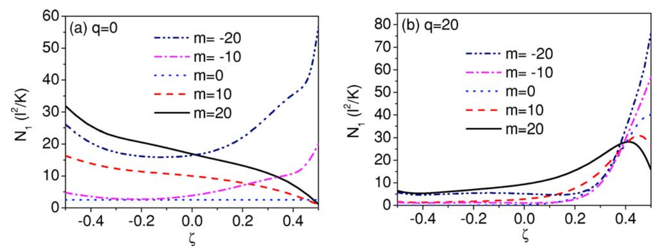

FIG. 1. (Color online) First normal stress difference N_1 vs ς. (a) $q=0$ and (b) $q=20$.

In Fig. 3 we have plotted the average first normal stress difference $\langle N_1 \rangle$, as a function of (a) q and (b) m. As can be seen, in contrast to our original discussion, $\langle N_1 \rangle$ is always positive independently of the direction of the flow and of the value of the electric field. The effect of the electric field is not simple, for example, for small values of the magnitude of the shear stress, the effect of the field is to increase the value of $\langle N_1 \rangle$, that is, the field increases the force between the plates, then, as we increase the magnitude of the shear rate, $\langle N_1 \rangle$ starts to decrease but remaining always positive [see Fig. 3 panel (b)]. Furthermore, for the largest values of the electric field, $\langle N_1 \rangle$ tend to be more symmetric and less de-

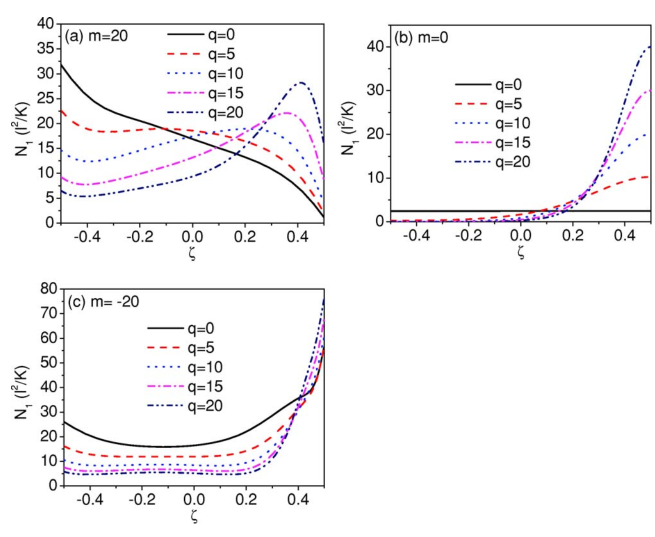

FIG. 2. (Color online) First normal stress difference N_1 vs ς. (a) $m=20$, (b) $m=0$, and (c) $m=-20$.

a)Author to whom correspondence should be addressed. Tel: +52(55)56224644, Fax: +52(55)56161201. Electronic mail: cmendoza@iim.unam.mx

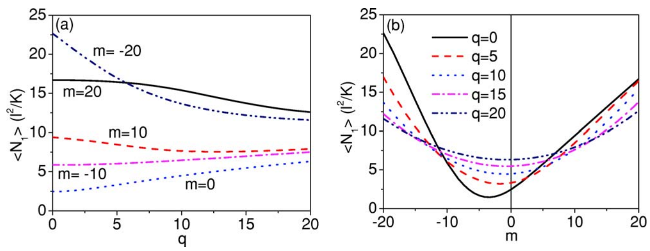

FIG. 3. (Color online) Averaged first normal stress difference as a function of (a) q and (b) m.

pendent on the shear flow. The rest of the conclusions in the paper[3] are unchanged.

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