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### Erratum: Micellar-shape anisometry near isotropic–liquid-crystal phase transitions

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## Erratum: Micellar-shape anisometry near isotropic–liquid-crystal phase transitions

### Abstract

In lieu of an abstract, below is the first paragraph:

In our paper the binary sodium dodecyl (lauryl) sulfate (SLS)–water system was investigated by small-angle x-ray scattering in the isotropic (*I*) phase up to the *I*-hexagonal (*H<sub>a</sub>*) transition and the ternary system (with decanol added to a binary system containing 26 wt% of SLS in water) up to what was considered to be an *I*-nematic cylindrical (*N<sub>c</sub>*) phase transition. Our paper did not focus on the phase diagram of the studied system but rather on the detailed modeling of the scattering curves in the *I* phase in terms of particle form factor and interference function. The aim of the paper was to determine the particle anisometries in the *I* phase as *I*-liquid-crystal phase transitions were approached, and to compare it with theories that predicted *I*(*N*)-*H* phase transitions in systems with self-association.

### Disciplines

Physics

### Comments

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## ERRATA

**Erratum: Micellar-shape anisometry near isotropic–liquid-crystal phase transitions**  
**[Phys. Rev. E 47, 2551 (1993)]**

R. Itri and L. Q. Amaral

[S1063-651X(98)08607-3]

PACS number(s): 05.70.Fh, 61.10.-i, 64.70.Md, 82.70.Dd, 99.10.+g

In our paper the binary sodium dodecyl (lauryl) sulfate (SLS)–water system was investigated by small-angle x-ray scattering in the isotropic ( $I$ ) phase up to the  $I$ -hexagonal ( $H_\alpha$ ) transition and the ternary system (with decanol added to a binary system containing 26 wt% of SLS in water) up to what was considered to be an  $I$ -nematic cylindrical ( $N_c$ ) phase transition. Our paper did not focus on the phase diagram of the studied system but rather on the detailed modeling of the scattering curves in the  $I$  phase in terms of particle form factor and interference function. The aim of the paper was to determine the particle anisometries in the  $I$  phase as  $I$ -liquid-crystal phase transitions were approached, and to compare it with theories that predicted  $I$ -( $N$ )- $H$  phase transitions in systems with self-association [1].

In the ternary system, five samples were investigated upon increasing decanol addition: samples AM1, AM2, and AM3 in the  $I$  phase, and sample AM4 (considered to correspond to an  $I+N_c$  coexistence) and a sample in the  $N_c$  phase. The decanol content was measured in terms of the decanol:SLS molar ratio ( $M_d$ ) for samples with the fixed water:SLS molar ratio ( $M_w=45.2$ ).

In this erratum, we show that, in fact, sample AM4 ( $M_d=0.195$ ) corresponds to an  $H_\alpha$  phase, intercalated between the  $I$  and the  $N_c$  phases upon decanol addition.

Although  $I-N_c$  phase transitions do occur in the ternary system for low SLS concentration, the sequence of phases  $I \rightarrow H_\alpha \rightarrow N_c \rightarrow N_d$  (nematic discotic)  $\rightarrow L_\alpha$  (lamellar) was observed by Quist *et al.* [2] in the region of higher SLS concentration. The phase diagram of Quist *et al.* [2] reproduced the nematic domain previously found by Amaral *et al.* [3,4] at lower SLS concentration and the limits of the  $H_\alpha$  phase obtained by Ekwall [5] when the nematic domain was not known yet. From Quist's phase diagram, the transition is  $I \rightarrow N_c$  for the concentrations reported in our previous paper, but the sequence  $I-H_\alpha-N_c$  could not be ruled out, since small differences in the materials' purity and temperature are possible.

X-ray results obtained by the photograph method mentioned in our paper are shown here in Fig. 1 for samples AM3 [Fig. 1(a);  $I$  phase], AM4 [Fig. 1(b)], and  $N_c$  phase [Fig. 1(c)]. In our paper, only the  $s^{-1}$  position of the first interference peak obtained from these photos was given in Table II; no careful measurements of the remaining peaks was made at that time. From this figure, it seems clear that the sample AM4 [Fig. 1(b)] is neither an  $I$  nor a  $N_c$  phase. An  $I+N_c$  coexistence was assumed in our paper because an  $I-N_c$  transition was expected from the previous phase diagrams [2,4] and from the theory [1]; sample AM4 was clearly neither  $I$  nor  $N_c$  between crossed polarizers in the test tube but no clear phase separation was observed.

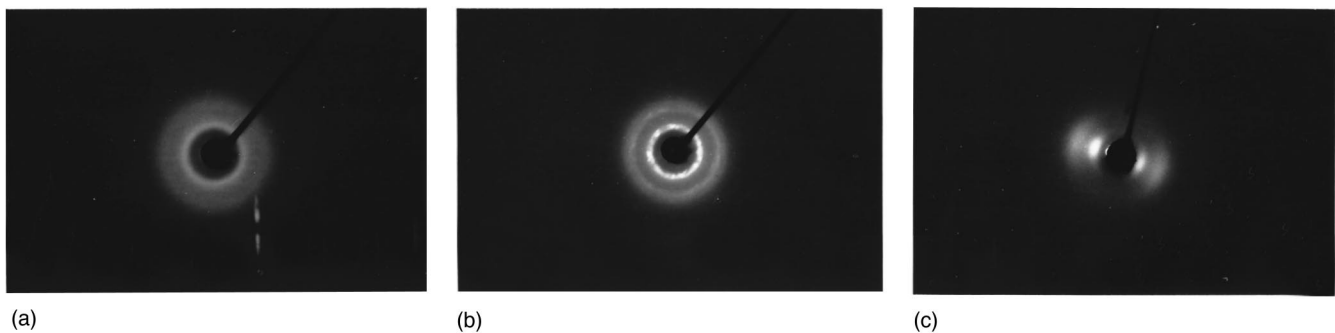


FIG. 1. X-ray diffraction results obtained by means of photographic technique (Laue transmission geometry; 10 cm sample-to-detector distance;  $\text{CuK}_\alpha\text{-Ni}$  filter radiation) from the samples: (a) isotropic AM3; (b) AM4; and (c)  $N_c$ , investigated in our paper. The  $N_c$  sample shows spontaneous surface orientation.

Only recently, we focused on the possibility that the  $H_\alpha$  phase could be present. A revision of the x-ray Laue photograph obtained with sample AM4 showed that there are three diffraction lines (the second stronger and the third weaker are very near) at  $s^{-1} = 56.0, 33.2,$  and  $27.9 \text{ \AA}$ , in the ratio of about  $1:1/\sqrt{3}:\frac{1}{2}$ , with some texture (notice that the diffraction lines are measured on the original photograph, where they are better defined than in the glossy copy of Fig. 1). In our paper the second and third lines were seen together as a second order (which appears in both the  $I$  and  $N_c$  phases).

The statement ‘‘for AM4 sample,  $I-N_c$  phase coexistence was observed’’ in the caption of Table II was in error. AM4 corresponds in fact to a  $H_\alpha$  phase, since the second diffraction line at  $1/\sqrt{3}$  is a ‘‘fingerprint’’ of this phase. The composition of sample AM4 was now repeated and x-ray results reproduced. Furthermore, observation in a polarized optical microscope showed birefringence in the whole sample. This phase was homogeneous and no phase separation occurred after several days of observation in the sample tube and in the capillaries.

Therefore, the correct phase sequence is  $I \rightarrow H_\alpha \rightarrow N_c$  upon increasing decanol concentration in the studied ternary system and not  $I \rightarrow N_c$ , as was previously assigned in our original paper. This also requires a revision of our comparison with Taylor and Herzfeld’s theoretical results [1]. The inversion of the predicted [1]  $I-N-H$  to the observed  $I-H-N$  behavior has to do with the fact that the theory holds only for binary systems, and it is not able to take into account properly the effect of the third component. The observed  $I-H_\alpha$  transition in the ternary system may be identified with the  $I-H$  behavior of the theory. The anisotropy  $\nu=3$ , obtained in the ternary system for sample AM3 in the vicinity of the  $I-H_\alpha$  transition, indicates that this  $H_\alpha$  phase in the ternary system must be very close to the triple point that separates  $I-H$  and  $I-N-H$  behaviors. An understanding of the observed  $H_\alpha-N_c$  transition needs further investigation of the decanol effect upon the  $H_\alpha$  phase and cannot be trivially explained by the theoretical model of self-association in binary systems.

<sup>1</sup>M. P. Taylor and J. Herzfeld, Phys. Rev. A **43**, 1892 (1991).

<sup>2</sup>P. O. Quist, B. Halle, and I. Furó, J. Chem. Phys. **95**, 6945 (1991).

<sup>3</sup>L. Q. Amaral, M. E. M. Helene, D. R. Bittencourt, and R. Itri, J. Phys. Chem. **91**, 5949 (1987).

<sup>4</sup>L. Q. Amaral and M. E. M. Helene, J. Phys. Chem. **92**, 6094 (1988).

<sup>5</sup>P. Ekwall, in *Advances in Liquid Crystals*, edited by G. H. Brown (Academic, London, 1975), Vol. 1, pp. 1–142.

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### Erratum: Analytic solutions of some coupled nonlinear equations [Phys. Rev. E **56**, 7253 (1997)]

F. T. Hioe

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PACS number(s): 42.65.Tg, 42.81.Dp, 03.40.Kf, 99.10.+g

On p. 7254,  $C_1$  of solutions VI and VII should read as follows:

Solution VI:  $C_1 = C(-B + 4A)/30$ ;

Solution VII:  $C_1 = (C/2)[-\frac{1}{5}\sqrt{\frac{5}{3}(B^2 - A^2)} + \frac{1}{3}(B - A)]$ .

On the same page,  $\Phi$  and  $\Psi$  on the left-hand side of the first part of Eq. (2.3) should be replaced by  $\Phi_1$  and  $\Phi_2$ , respectively.