Optics
2013; 2(6): 67-70
Published online January 30, 2014 (http://www.sciencepublishinggroup.com/j/optics)
doi: 10.11648/j.optics.20130206.11

The effect of mixture of AOT microemulsion with PEG-PPG-PEG tri-block polymer on surface

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To cite this article:
Soheil Sharifi, Esmaeil Doodman, Ahmadreza Daraei. The Effect of Mixture of AOT Microemulsion with PEG-PPG-PEG Tri-Block Polymer on Surface. *Optics.* Vol. 2, No. 6, 2013, pp. 67-70. doi: 10.11648/j.optics.20130206.11

Abstract: The mixture of tri-block polymer with microemulsion on surface is studied with AFM. The study the topography of surface shows with increase of concentration of polymer, the high distribution doesn't change but the wide of size is increasing. Moreover, the mixture of AOT microemulsion with tri-block polymer was coated and drying on surface, is studied with AFM. The results shows, the high distribution parameter increase with increase of polymer concentration on microemulsion

Keywords: Optic, Surface, Surfactant, AFM

1. Introduction

In general most of the polymers having useful optical properties and application for example the optical glasses, packaging and electro-optic instruments, [1-3]. A lot of optical property of polymer was studied before, [4-7].The optical property of polymer depends to the polymer formation on the surface and the formation of polymer depends to the interaction of polymer with surface and between the polymer chains, [8,9]. So, one of interesting topic is to study the polymer composition and topography on surface. In this work, the two concentration of tri-block polymer was coated on surface and it was studied by AFM. The combination of Sodium-2-diethylhexyl sulfosuccinate (AOT) with water and decane as oil produce microemulsion that is consist of water/surfactant droplets to the decane in general the mixture of PEG-PPG-PEG tri-block polymer produce a network between the droplets of microemulsion on solutions. In this work, the different combination of AOT microemulsion mixed with PEG-PPG-PEG tri-block polymer was coated and dying on the surface is studied with AFM. The schematic of effect of tri-block on surface is presented in the fig.1(a) and mixture of tri-block polymer with surfactant is presented in the figure 1(b).

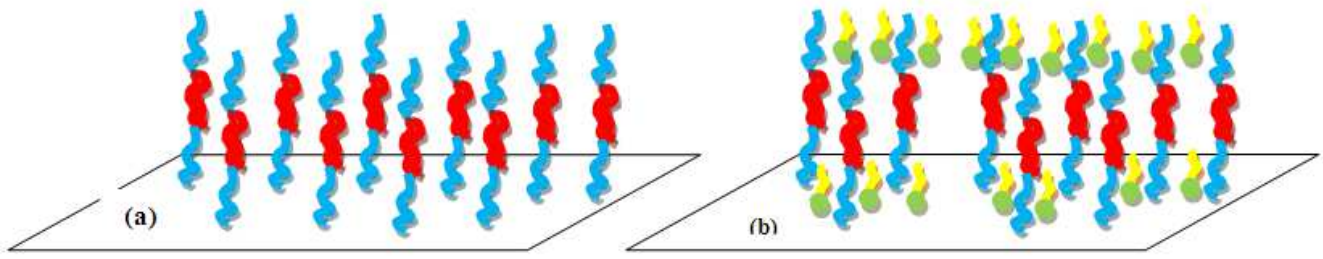


Fig 1. *Schematic of (a) tri-block polymer on surface (b) tri-block polymer with microemulsion on surface.*

2. Experiments

Decane was obtained from Merck with $M_w = 142.92$, and Sodium-2-diethylhexyl sulfosuccinate, or AOT 99% (an Alfa product) with $M_w = 444.55$ and PEG-PPG-PEGtri-blockpolymer from Sigma-Aldrich company with $M_n \approx 1100$, purities of these substances were 99%, 96% and 99%, respectively. The AOT microemulsion was

prepared with mass fractions of droplet of 0.05 and 0.025, stirred well. By adding amount of PEG-PPG-PEG tri-block polymer to the microemulsion, network was made between droplets. After adding polymer, the microemulsion was shook well by shaker device for 24 hours. The mixture of PEG-PPG-PEG tri-block with microemulsion was prepared with different concentration, presented in the table 1, that X is molar ration of surfactant to water (X=[AOT]/[Water]), mfd=(mass of droplet)/(total mass) and mfpoly=(mass of polymer)/(total mass). The different concentration of polymer was prepared and presented in the table 2.

Table 1. *The names and consecrations of mixture of tri-block polymer with AOT microemulsion.*

X	mfd	mfpoly	Name
9	0.05	0.00625	B7
37	0.05	0.0125	C3
37	0.05	0.00625	C5

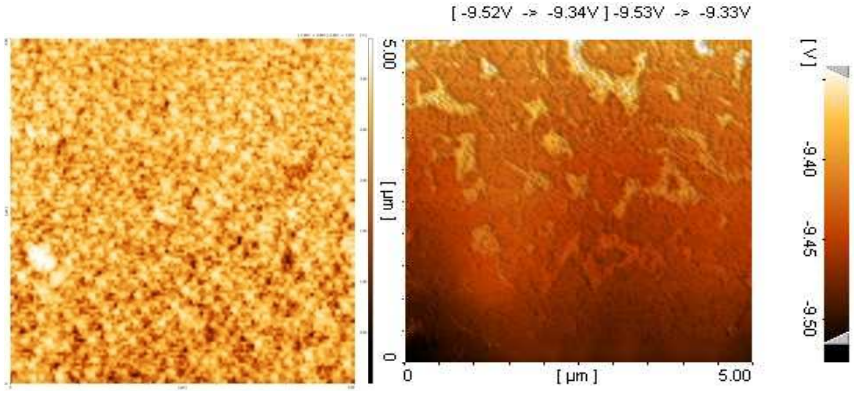
Table 2. *The names and concentrations of tri-block polymer was prepared for experiment.*

Present of polymer on water	Name
0.18%	D3
0.5%	D5

The AFM observation is performed with a DME atomic force microscopy (Danish Micro Engineering A/S DK-2730 Denmark). The experiments were carried out at room temperature in non-contact mode. AFM images were obtained by measurement of the interaction forces between the tip and the sample surface [10-12].

3. Results

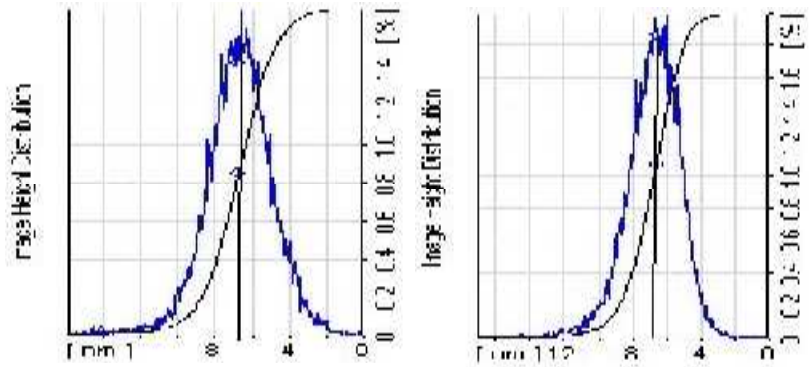
The PEG-PPG-PEG tri-block polymer solution with two concentrations, 0.18% and 0.5% was coated in the surface by spin coating on glass substrate, and drying at room temperature, fig.2.



(a) (b)

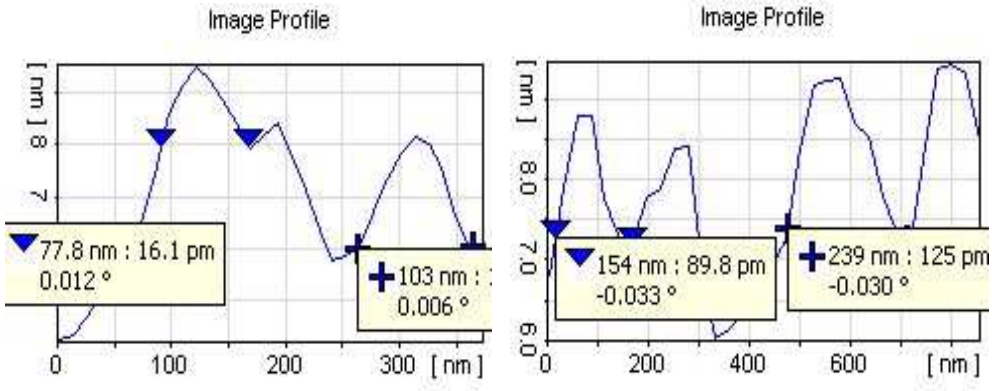
Fig 2. *AFM images of mixture of PEG-PPG-PEG tri-block polymer with water coated on glass surface and drying at room temperature with different combination of polymer, (a) 0.18 present of polymer on water (b)0.5present of polymer on water.*

In the fig.3, shows high distribution of surface with PEG-PPG-PEG tri-block polymer at different concentration of polymer. These results shows with increase of concentrating of polymer, the high distribution don't change but the wide of size is increasing, fig2. The imaging of size of surface is presented in the figure,4.



(a) (b)

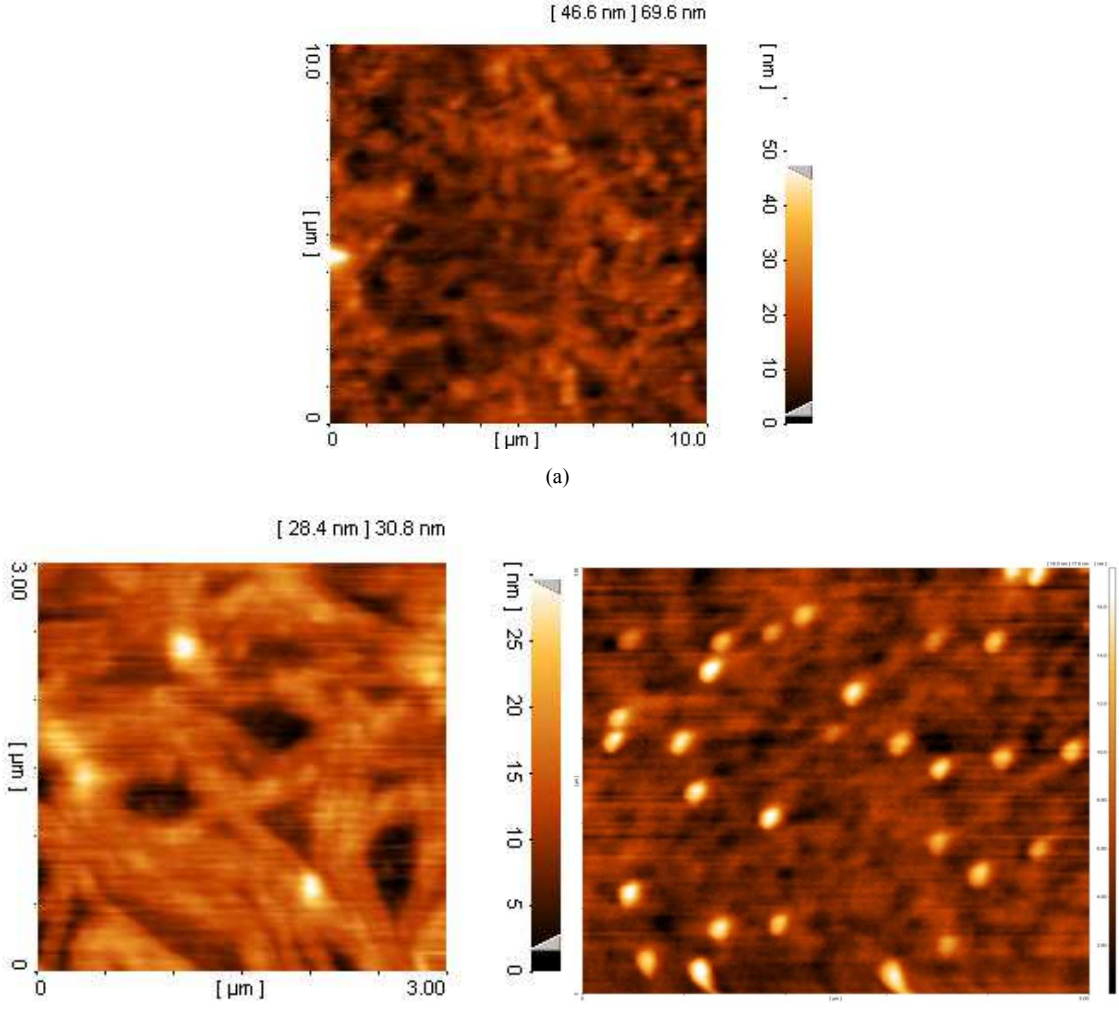
Fig 3. *Height distribution surface of PEG-PPG-PEG tri-blockpolymer coated on glass surface and drying at room temperature with different combination of polymer, (a) present of polymer on water 0.18% (b) present of polymer on water 0.5%.*



(a) (b)

Fig 4. *Profile image of PEG-PPG-PEG tri-blockpolymer with water coated on glass surface and drying at room temperature with different combination of polymer, (a) present of polymer on water 0.18%(b) present of polymer on water 0.5%.*

Moreover, in this work, we prepare AOT microemulsion mixed with PEG-PPG-PEG polymer and then it was coated on the glass surface. The mixture of polymer with microemulsion prepare with a concentration of polymer at mfpoly=0.00625 with X=9 and mfd= 0.05, fig.5 (a) and X=37 at mfpoly=0.0125 and mfpoly=0.00625, fig.5 (b) and (c).



(a)

(b) (c)

Fig 5. *AFM images of mixture of AOT microemulsion with PEG-PPG-PEG tri-blockpolymercoated on glass surface and drying at room temperature with different combination of surfactant and polymer.(a) X=9, mfd=0.05 and mfp=0.00625 (B-7),(b) X=37, mfd=0.05 and mfp=0.0125(C-3), (c) X=37, mfd=0.05 and mfp=0.00625(C-5).*

The study of the high distribution of surface with different composition of microemulsion with polymer is shows with change molar ratio from 9 to 37 the results shows with change the molar ration of microemulsion the high distribution parameter don't change, fig.6, but with increase of polymer concentration, the high distribution parameter increase from 5nm to higher than 12nm.

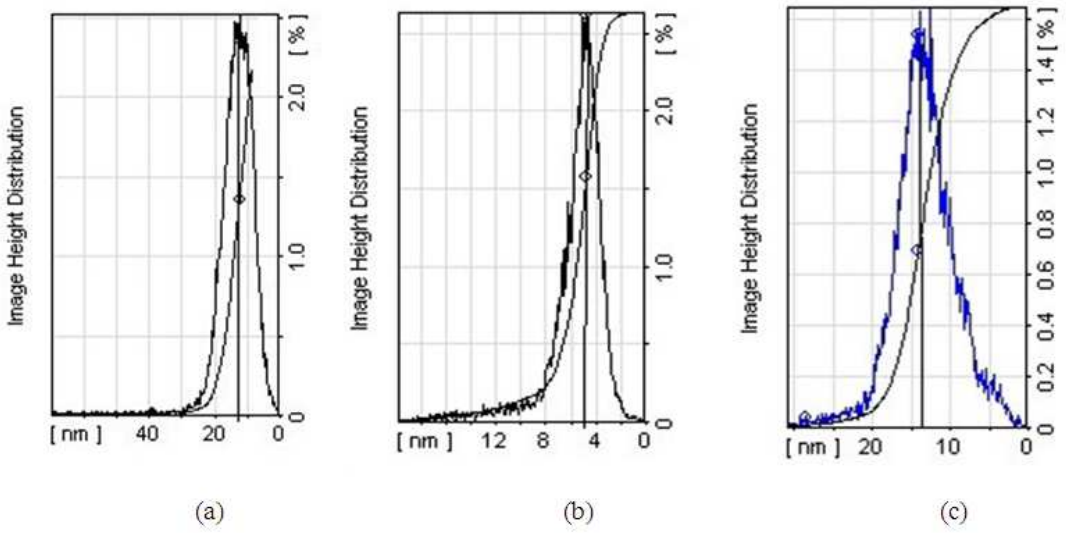


Fig 6. *Height distribution of mixture of AOT microemulsion with PEG-PPG-PEG tri-block polymer coated on glass surface and drying at room temperature with different combination of surfactant and polymer.(a) X=9, mfd=0.05 and mfp=0.00625 (B-7). (b) X=37, mfd=0.05 and mfp=0.0125(C-3). (c) X=37, mfd=0.05 and mfp=0.00625(C -5).*

4. Conclusions

The mixture of microemulsion and triblock polymer on surface is studied by AFM experiment. The wide of size of the aggregated polymer on surface is increasing with increase of tri-block polymer concentration. The mixing of surfactant with tri-block polymer on the surface is increasing the high distribution of surface. That explains aggregation of polymer become well on surface.

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