Surface activity behavior of photo-sensitive diblock copolymer having carboxymethyl betaine

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Key Word: Block copolymer / Photo sensitivity / Vesicle / Surface activity / RAFT / Light-Scattering

It has been well established that ionic amphiphilic blockcopolymers, unlike low molecular weight surfactants, show non-surface activity [1]. The "non-surface activity" behavior is interpreted by image charge effect which originates from repulsion of ionic block at interface and stable micelle formation [1]. Blockcopolymers with photosensitive block are known to show polarity alteration on light irradiation which may be resulted in modification in surface activity behavior. Similar activities are also expected with change of some other external factors such as pH and/or ionic strength of the solution. This work focused on surface activity behavior of diblock copolymer, $(EMMAB)_m$-*b*-$(GLBT)_n$, at air water interface upon different stimuli such as light, salt and pH change. (See Figure 1a for polymer structure) Carboxymethyl betaine block (GLBT) of diblock copolymer, is zwitterionic and pH sensitive. Hydrophobic block of copolymer bears azobenzene chromophore which affects surface activity of copolymer upon UV radiation of 360 nm in solution. Copolymer was observed to be surface active at neutral pH and became non-surface active in alkaline or acidic solution. (Figure 1a and 1b) Copolymer became non-surface active upon UV irradiation at pH 7. (Figure 1b) This can be explained due to photoisomerization of azobenzene from *trans* to *cis* isomer which alters the polarity of the block and hence modification in surface activity behavior of polymer was observed. This type of system can be useful in various applications such as development of light and/or pH sensitive drug delivery system.

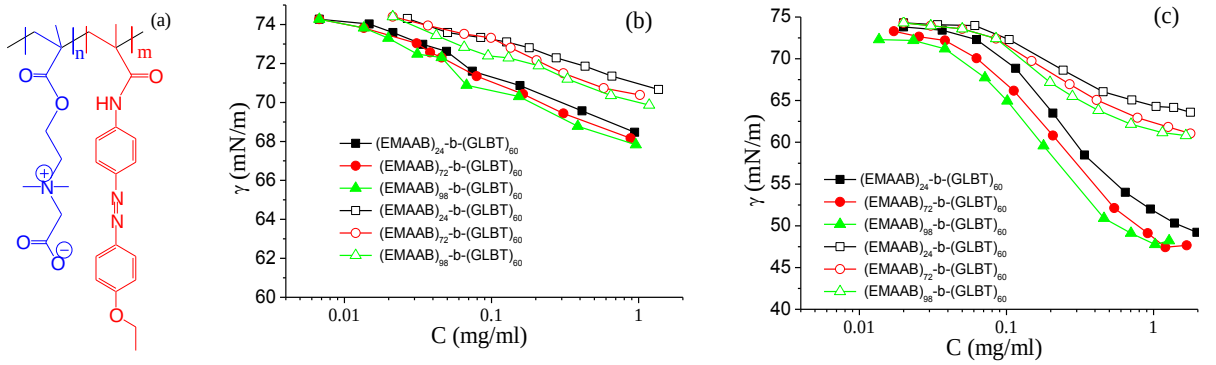

Figure 1 (a) Chemical structure of diblock copolymer $(EMAAB)_m$-*b*-$(GLBT)_n$; (b) and (c) surface tension change with polymer concentration in 20 mM phosphate buffer of different pH (b) pH 2 (c) pH 7 before (filled symbols) and after UV irradiation (open symbols)

[1] Matsuoka, H.; Chen, H.; Matsumoto, K. *Soft Matter*, **2012**, *35* , 9140-9146.