



The possible mode of interaction between MB dye and CaHAp surface.

#### References:

- [1] Sangeetha, K.; Vasugi, G.; Girija, E. K., 2015, *Int J. Chem. Tech. Res.*, 8, 117.  
 [2] Saber-Samandaria, S.; Saber-Samandarib, S.; Nezafatic, N.; Yahya, K., 2014, *J Environ Manage.*, 146, 481.  
 [3] Googerdchian, F.; Moheb, A.; Emadi, R., 2012, *Chem. Eng. J.* 200–202, 471.

**Keywords:** Hydroxyapatite, Biopolymer, Adsorption.

## MS17-P02

### Small-angle X-ray scattering studies on the self-assembly of disc shaped bicelles with DNA

Tsang-Lang Lin<sup>1</sup>, Yuan Hu<sup>1</sup>, Ru-Kuei Lin<sup>1</sup>, Ching-Hsun Yang<sup>1</sup>, Po-Wei Yang<sup>1</sup>, U-Ser Jeng<sup>2</sup>

1. Department of Engineering and System Science, National Tsing Hua University, Hsinchu, Taiwan

2. National Synchrotron Radiation Research Center (NSRRC), Hsinchu, Taiwan

**email:** [tllin@mx.nthu.edu.tw](mailto:tllin@mx.nthu.edu.tw)

Disc-shaped bicelles can be formed spontaneously by mixing long-chain lipids with short-chain lipids at suitable ratios. The long-chain lipids form the bilayer core of the bicelle while the short-chain lipids form the protecting rim of the bicelle. The typical mixed lipid bicelles have a relatively uniform diameter around 20 nm. The surface charge of such bicelles can be varied by doping with cationic lipids to form cationic bicelles (CB) or with anionic lipids to form anionic bicelles (AB). Different from the typical method of encapsulating DNA with liposomes, bicelles can also be used to form cationic or anionic bicelle-DNA complexes [1-3], which can be used as nonviral vectors for improving the transfection efficiency of gene therapy. As revealed by small-angle X-ray scattering and TEM, one-dimensional alternating stacks of disc cationic bilayer plates (bicelles) and DNA arrays were formed spontaneously. DNA molecules encapsulated between the disc bilayer plates form ordered arrays with a spacing around 4~5 nm. The number of the stacking layers can be easily tuned from just a few stacks to more than one hundred stacks by adjusting the doping percentage of the cationic lipid. It is also possible to form anionic bicelle-DNA complexes with the help of the divalent cations. The DNA-ion-disk bilayer complexes are formed in the investigated range of 10 mM to 100 mM calcium ion concentrations. Other than using short-chain lipids, it was found that bicelles can also be formed at a Triton X-100 to DPPC molar ratio around 1 to 2. As compared with the diC7PC/DPPC bicelle, which can be formed for a diC7PC to DPPC molar ratio around 0.2 to 1, it seems that it takes more Triton X-100 than the short-chain lipid to form bicelles for a fixed amount of DPPC. The prepared DPPC/Triton X-100 cationic bicelles were also found to be able to form complexes with DNA.

#### References:

- [1] Yang, P.-W.; Lin, T.-L.; Lin, T.-Y.; Yang, C.-H.; Hu, Y. & Jeng, U.-S. (2013) *Soft Matter*, 9, 11542.  
 [2] Yang, P.-W.; Lin, T.-L.; Hu, Y. & Jeng, U.-S. (2014) *Soft Matter*, 10, 2313.  
 [3] Yang, P.-W.; Lin, T.-L.; Hu, Y. & Jeng, U.-S. (2015) *Soft Matter*, 11, 2237.

**Keywords:** bicelle, small-angle X-ray scattering, DNA encapsulation