Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Liquid crystal self-assembly of zirconium phosphate nanosheet in polymeric matrix XIAYUN HUANG, XUEZHEN WANG, ZHENGDONG CHENG, Texas A&M University — The controlled assembly of nanomaterials requires them to be well-organized over large area with controlled orientation and density. Although progress has been achieved via Langmuir-Blodgett technique, electric field directed assembly, and flow-assisted alignment, it remains a challenge for the future to control the density and orientation, especially the anisotropic particle, in the polymeric matrix. Here, we investigate the controlled assembly via liquid crystal assembly of discotic α-zirconium phosphate (α-ZrP) aqueous suspension. Liquid crystal is the material with spontaneous orientation order and our group have shown the strong aspect ratio dependency of the isotropic-nematic transition of discotic α-ZrP nanosheet suspension. These α-ZrP discotic suspension exhibited the stable nematic alignment at low volume factions. When volume faction increases, it follows with the phase transition to sematic phase. Moreover, intrinsic high anisotropic nanosheet enables the formation of highly ordered liquid crystal orientation at much reduced concentration and the polymeric matrix brings the extra-functionalities, such as thermal, optical, electrical and mechanical properties. The liquid crystal phase orientation will remains in the polymeric matrix and the polymeric matrix serves as the interlayer spacer. The liquid crystal polymer nanocomposite was fabricated using high-aspect-ratio α-ZrP nanosheet embedded into a polymeric network. Due to the hydrogen bonding interaction of hydroxyl group of α-ZrP and polymeric matrix, liquid crystal nanocomposite has the interesting thermal-optical response.

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Date submitted: 14 Nov 2014 Electronic form version 1.4