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Molecular Complexation and Phase Diagrams of Urea/PEG Mixtures[1] GUOEPENG FU, THEIN KYU, The University of Akron — Polyethylene glycol (PEG) and urea complexation has been known to form a stable crystal due to molecular complexation. The effect of molecular weight of PEG on the phase diagrams of its blends with urea has been explored. In the case of high molecular weight PEG8k/urea, the observed phase diagram is azeotrope, accompanied by eutectoid reactions in the submerged phases such as induced stable "alpha" phase crystals and metastable "beta" phase crystals. The metastable crystal can transform to stable crystal under a certain thermal annealing condition. However, the phase diagram of PEG1k/urea is of coexistence loop, whereas PEG400/urea exhibits eutectic character. Subsequently, the change of azeotrope to eutectic behavior with PEG molecular weight is analyzed in the context of the combined Flory-Huggins theory of liquid-liquid demixing and phase field theory of crystal solidification. Of particular interest is that only a very small urea amount (2 wt%) is needed to form a stable inclusion crystal via complexation with PEG. Potential application in lithium battery is discussed based on AC impedance spectroscopy and cyclic voltammetry.

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Guoepeng Fu
The University of Akron

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