

1010-35-33

Hailiang Liu* (hliu@iastate.edu), Department of Mathematics, Iowa State University, Ames, IA 50010, and **Hui Zhang** and **Pingwen Zhang**. *Axial Symmetry and Classification of Stationary Solutions of the Doi-Onsager Equation.*

We study the structure of equilibrium solutions to the Doi-Onsager equation with Maier-Saupe potential on the sphere, which arises in the modeling of rigid rod-like molecules of polymers. The stationary solutions are shown to be necessarily a set of axially symmetric functions, and a complete classification of parameters for phase transitions to these stationary solutions is obtained. It is shown that the number of stationary solutions hinges on whether the potential intensity crosses two critical values $\alpha_1 \approx 6.731393$ and $\alpha_2 = 7.5$. Furthermore, we present explicit formulas for all stationary solutions. (Received August 02, 2005)