

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Correction of Doi-Edwards' Green function in harmonic potential and its implication for stress-optical rule¹ TSUTOMU INDEI, JAY SCHIEBER, Illinois Institute of Technology, Department of Chemical and Biological Engineering, and Center for Molecular Study of Condensed Soft Matter — We derive a corrected Green's function for a polymer chain trapped in a two-dimensional anisotropic harmonic potential with a fixed boundary condition. This Green's function is a modified version of what Doi and Edwards first derived to describe the polymer chain trapped in the tube-like domain of surrounding entangled polymers [J. Chem. Soc. Farad. Trans. II 74 (1978) 1802]. In contradiction to the results found by Ianniruberto and Marrucci using the incorrect Green's function [J. Non-Newtonian Fluid Mech. 79 (1998) 225], we find that the stress-optical rule is violated for any tube potential either circular or elliptic. The violation is due to the presence of the virtual springs to trap the chain in the tube rather than the anisotropy of the confinement potential.

¹Army Research Office (grants W911NF-08-2-0058 and W911NF-09-1-0378)

Tsutomu Indei
Illinois Institute of Technology, Department of Chemical and
Biological Engineering, and Center for Molecular Study of Condensed Soft Matter

Date submitted: 28 Nov 2012

Electronic form version 1.4