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Editorial corner – a personal view
Intrinsic fluorescence: an effective means to monitor macromolecular chain motions

*M. Q. Zhang**

Materials Science Institute, Zhongshan University, Guangzhou 510275, P. R. China

Fluorescence technology belongs to photoluminescence spectroscopy, and has been applied to the investigation of macromolecular chain movements. Although a number of useful information dealing with polymer micro-morphology and microstructure can be obtained accordingly, fluorimetric studies used to be conducted by pre-introducing probes or labels that carry chromophores into the system of interests. In spite of the difficulty of bringing the sensors, either the probes that are physically dispersed in macromolecules or the labels that are covalently attached to macromolecular chains would change microenvironment of the macromolecules and make the macromolecules more hydrophobic. As a result, their complexation ability is enhanced, and the condensed status revealed by fluorescence behaviors differs from the authentic situation.

In fact, macromolecular chain motions of polymers can be monitored by intrinsic fluorescence in case the macromolecular chains contain chromophores. For instance, intrinsic fluorescence of polystyrene has been shown to be highly sensitive to the issues ranging from local polymer conformational populations in solution and phase behavior in solvents and polymer blends to local microenvironments in bulk homopolymers. Relaxations and cold-crystallization processes in polymer (e.g. poly(trimethylene terephthalate)) were thoroughly characterized by intrinsic fluorescence spectroscopy. Compared to conventional approaches, more detailed information about structural variations can be provided, for example, molecular arrangement in induction stage of cold-crystallization. In addition, by focusing on excimer of intrinsic fluorescence, kinetic process of spinodal decomposition in phase separation of polystyrene/poly(vinyl methyl ether) blends was quantitatively studied.

However, optical physics of inherent chromophores has been less studied so far. The relationship between intrinsic fluorescence and macromolecular microstructure becomes somewhat difficult to be interpreted. This may explain why people prefer probes and labels, as reflected by literature survey.

To have objective images of macromolecules movement, intrinsic fluorescence is worth being well explored. Taking its advantages of simplicity and sensitivity, it would be extended for studying oxidation and degradation of polymers. With the help of different inherent chromophores on macromolecular chains, interfacial interaction in polymer blends might be evaluated. By changing temperature, more specific kinetics of the subjects mentioned above would be further understood.

Prof. Dr. Ming Qiu Zhang
Member of International Advisory Board

*Corresponding author, e-mail: ceszmq@mail.sysu.edu.cn