

## EDITORIAL

# Special Issue: Application of Quantum Beams to Polymer Science and Engineering

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Quantum beams, including neutron sources and synchrotron radiation, are becoming increasingly critical in the study of polymeric materials. This cutting-edge analytical tool is expected to lead to the creation of new materials with revolutionary properties and functions.

This special issue contains peer-reviewed invited and contributed papers on the 'Application of quantum beams to polymer science and engineering'. This special issue was prepared in order to show the progress among researchers utilizing synchrotron radiation and neutron beams. The special issue presents papers covering a variety of neutron and synchrotron beam technologies and their applications to polymer science and engineering.

This collection includes the new set-up for grazing incidence wide angle X-ray diffraction/grazing incidence angle X-ray scattering/X-ray reflectivity that has been designed and constructed at SPring-8 (Hyogo, Japan) and the neutron reflectometer that has been constructed at J-PARC (Ibaraki, Japan). The benefit of visualization with a Zernike-type X-ray microscope as a promising technique for understanding nanoscale deformation with the aid of finite element analysis is also presented. Additionally, an introduction to the new technique, X-ray photon correlation spectroscopy, which is beginning to be recognized as a powerful tool to characterize the dynamics of polymer systems, is also included. Furthermore, neutron analysis is

known to provide complementary information to X-ray analysis. By using deuterium labeling, various contrast enhancements have been shown to be achieved for neutron scattering of bulk materials. Neutron reflectivity is also revealed to be a powerful tool to characterize the buried interfaces including liquid/solid and solid/solid interfaces. On the other hand, from the materials point of view, the application of a quantum beam to various engineering materials such as rubber, polyolefin, polyester, epoxy, polymer composites is also reported in this special issue.

As guest editors of this thematic issue, we sincerely hope that this special issue will be beneficial in aiding future applications of quantum beams in polymer science and technology. Finally, we wish to thank all the authors and referees for their contributions to this issue.

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