Radiation Technology is still Important for Material Industry in China

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Radiation research has been carried out for more than 60 years, radiation ionizing induced chemical reactions in liquid, solid and gases have been well understood. Kinetics and intermediate species of various reactors in water are well established by pulse radiolysis on time scales of microsecond and even picosecond. From the point of view of application, radiation technology has been recognized as an effective and unique approach for manufacture of a variety of cross-linking polymer products, as well as for sterilization of food, herbs, medical components, etc.

In China, we have seen a fast growing market of radiation-relevant industry in the past, including radiation sterilization service and new material fabrication. The convincing evidence is the large number of gamma-irradiation facilities (~140 units) and accelerators (300–400 units) in operation. The beam energy of accelerators being used ranges from 200 KeV to 10 MeV. Such an increase in the number of accelerator is attributed to the fabrication by local Chinese companies.

However, if we look at the research activities being carried out in laboratories of universities and public institutions, the situation is not optimistic. Similar to the developed nations such as the US, EU and Japan, fewer scientists or groups show interest in radiation chemistry or radiation technology. This is normally due to the opinion that radiation technology is mature and out-of-date, and it is very difficult to achieve new findings. It is really true that radiation induced chemical reactions in water and polymers can be expected based on our accumulated knowledge.

What I want to address is the endless possible applications of radiation technology in industry. As is well known, radiation grafting is an effective method to anchor functional moieties to surfaces of fiber, film, sheet and any other shape of polymer materials. By utilizing this technique, it is possible to fabricate various new materials, e.g. anti-bacterial fiber, superhydrophobic textile, hydrophilic polymer film, heavy metal & radionuclide adsorbent, etc. If two or more functional groups are grafted to polymer surface, then we will have a number of combination choices. With the development of low energy electron beam accelerator, it is believed that radiation surface modification will be applied greatly in material industry in the future. It is also important to find new application of existing technology or knowledge. Taking an example, radiation degradation of chitosan in solid state or in aqueous solution has been investigated for about 20 years. The author's group carried out a lot of tests of radiation degraded chitosan in different animals through collaborations with universities and companies, we found that low-molecular-weight chitosan fabricated by this technology can be used as an effective animal feed additive in place of widely-used antibiotics in China. The goodness of this chitosan has been demonstrated in many pig and chicken farms.

In short, application-oriented radiation technology is still useful and will continue to play an important role in the fabrication of new materials. The most important thing is that we must have innovative ideas to utilize this technology and convince the users in material industry.

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