

# Imposing Restrictions on Hazardous Substances in Plastics

With the support of the Academic Division of the Chinese Academy of Sciences, a task force headed by Prof. DUAN Xue, a CAS Member from Beijing University of Chemical Technology, has conducted studies on the development of safe plastics. The following paragraphs summarize the suggestions of the task force to the central authorities.

## 1. Plastic as an important fundamental material

Thanks to its excellent physical properties, good malleability and high cost-effectiveness, plastic is widely used in a variety of sectors ranging from architecture, civil engineering, home appliance manufacturing, cable and wire products to agriculture and health care. High-performance engineering plastic and its composites, in particular, are playing a key role in cutting-edge industries such as microelectronics, space and nuclear energy.

The past decade has witnessed double-digit growth of China's plastic processing industry. From 2003 to 2014, its output value grew 20.62% annually, much higher than the national average for industrial productivity. In 2015, the output of plastics in China reached 75.60 million tons, exceeding all other countries in terms of both production and consumption. Clearly, plastic is fundamentally important materials in this country.

## 2. Hazardous substances in plastics

### (1) Sources

Many additives are commonly used in the different stages of plastic production so as to meet the requirements of its synthesis, molding, processing and performance. There are more than 2,000 kinds of such additives and byproducts from synthesis and molding processes in a total of 13 categories. Of this number,

more than 100 are toxic and therefore harmful, including catalyzers, heat stabilizers, lubricants, plasticizers, antioxidants, initiators and flame retardants.

### (2) Social incidents caused by hazardous substances in plastics

Hazardous substances of plastics pose extensive and long-term threats to people's health and environmental safety. Their effects are more significant in infants and elderly people. Over the past 10 years they have resulted in many social incidents both at home and abroad, such as toxic toys in 2007, plasticizers and bisphenol A (BPA) baby bottles in 2011 and toxic running tracks in 2014.

## 3. Current laws, regulations and standards concerning hazardous substances in plastics in China and around the world

### (1) In developed countries

In the European Union legal frameworks and systems of standards have been established and steadily improved. Since 2003, the EU has successively issued RoHS (restrictions on the use of certain hazardous substances in electrical and electronic equipment) and REACH (regulations concerning the Registration, Evaluation, Authorization and Restriction of Chemicals), which applies to more than 30,000 chemicals, including food contact materials, electrical and electronic equipment, toys, scrap electrical and electronic equipment, textile products and related materials. The restriction standards have become increasingly strict. While setting ever higher green trade barriers for large commodities from non-EU countries, such standards significantly raise the monitoring and restriction levels of various hazardous substances in plastics.

It is specified in the RoHS issued in 2003 that

electrical and electronic equipment containing six kinds of hazardous substances (hg, Pb, Cr VI, Cd, PBDEs, PBBs) are not allowed to enter the EU market. The implementation of RoHS has had a huge impact on China's export industry. The REACH regulations issued in 2007 have had a much wider influence than RoHS.

#### (2) Relevant laws, regulations and standards in China

China's laws, regulations and standards in the field have mainly followed those in developed countries such as the EU countries and the US. For instance, after RoHS the Chinese Ministry of Industry and Information Technology promulgated *Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products and Marking for the Control of Pollution Caused by Electronic Information Products*. In general, they cannot meet the requirements of effective monitoring and restriction of those substances at the national level. There is a lack of comprehensive legislation and consistent overcharging design built into the control of those substances at the national level.

#### **4. The status quo of China's research and development of technology for finding substitutes for hazardous substances in plastics**

To address the problem of the health and environmental impact of hazardous substances in plastics, Chinese scientists and engineers have implemented basic and applied studies. The result is the development of a series of green synthesis and molding technologies and some additives with little or no toxins. However, the research is limited by a shortage of strategic guidelines for setting objectives and devising development programs. Furthermore, key national programs lack unified planning for basic and industrial application research, which severely limits the promulgation, dissemination of technological results.

#### **5. Recommendations for restricting the use of hazardous substances in plastics**

It is advisable to assign priority to the following three tasks in order to promote structural realignment to a green and sustainable future for relevant industries.

##### (1) Overarching design

###### A. Strengthen organizational guarantee

A joint committee should be established under the coordination of the China Petroleum and Chemical Industry Federation and China Plastics Processing Industry Association and should include the participation of such organizations as the National Development and Reform Commission, the Ministry of Industry and Information Technologies, the Ministry of Science and Technology, and the National Natural Science Foundation of China. Its tasks include the formulation of relevant regulations and standards and making plans for research and development programs.

###### B. Planning and implementation

It is advisable to formulate a long- and mid-term development plan and an early-warning system. Efforts should be made to prepare a roadmap for the replacement of hazardous substances so as to strengthen and monitor the enforcement of the relevant plans. It is important to make suitable connections between up- and down-stream studies and between basic research and application sections.

##### (2) Facilitate innovation-driven development

###### A. Basic research

It is advisable for the National Natural Science Foundation of China to set up key research programs to support the joint industrial research centers to conduct basic and systematic studies and original and directional research.

###### B. Technology development

It is advisable for the Ministry of Science and Technology to coordinate industrial research into 15 key projects in three categories and for the Ministry of Industrial and Information Technology and other relevant organizations to launch technology commercialization projects.

###### C. Industrial layout

Effort should be made to conduct overall planning on the entire industrial chain of molding and processing in which upstream resin is synthesized into downstream products by taking into account of the categories of resin and their applications. It is advisable to set up ten demonstration centers for green processing of plastic in ten categories.

##### (3) Strengthen policy guarantee

###### A. Testing methods and specifications

It is important to formulate or revise the testing methods and specifications for hazardous substances in

plastics by closely following the development trends of relevant regulations and standards internationally and in line with China's strategy.

B. Forming a system of standards

It is important to formulate relevant standards according to international practice, encourage industrial upgrading and overcome the "green technology barrier" of developed countries. Efforts should be made to form

an entire system of standards, upgrade technological levels and pursue voluntary substitution.

C. Policy and regulations

It is important to formulate a list of toxic and hazardous substances, improve the system of penalties and encourage companies to adopt new technologies and develop new products.

