

建筑“装”定制

FASHION IN ARCHITECTURE

塑料

PLASTIC

凤凰空间·北京 编



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图 1 我社出版科调换。

谨以此书高调迎接建筑立面的个性化时代，或者说建筑
“时装定制”时代的到来。

This book is dedicated to the forthcoming era of individualized building facades, or the era
of "custom fashion" for architecture.



前言

PREFACE

■ 塑料材料为合成的高分子化合物 { 聚合物 (polymer) } , 又可称为高分子或巨分子 (macromolecule) , 也是一般所俗称的塑料 (plastic) 或树脂 (resin) 。

■ 从第一个塑料产品赛璐珞诞生算起, 塑料工业迄今有百余年的历史。

■ 澳大利亚墨尔本市莫纳什大学机械工程系主任里斯·琼斯教授预言: 尖端的塑料合成材料, 将成为未来建筑的新材料。

■ 塑料建材不仅能替代木材、钢材等传统建材, 而且还具有节能节材、保护生态、改善居住环境、提高建筑功能与质量、降低建筑自重、施工便捷等优越性。

■ 塑料的节能效益十分突出, 以生产能耗计算, 塑料制品为钢材和铝材生产能耗的 1/4 和 1/8。

■ 塑料将继续为建筑的发展做出巨大贡献。

■ Plastic is a synthetic polymeric compound (polymer) or macromolecule, commonly known as plastic or resin.

■ Plastic industry has a history of over 100 years since the appearance of the first plastic product Celluloid came into being.

■ Professor Rhys Jones, head of Department of Mechanical Engineering at Monash University, Melbourne, Australia, predicted that advanced plastic composites will become the new materials for future architecture.

■ Plastic can not only replace wood, steel and other traditional building materials, but also superior in many aspects such as energy-efficient, environment-friendly, and helpful for improving living environment. Additionally, it can improve the function and performance of architecture, reduce the structural weight and it is convenient for construction.

■ The energy efficiency of plastic is prominent. The energy consumption of plastic products is only one fourth of steel products and one eighth of aluminum products.

■ Plastic will continue to make big contribute to the development of architecture.



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第一部分 PART 1

建筑塑料“时装” 历史

HISTORY OF PLASTIC "FASHION"
IN ARCHITECTURE

在这里，我们一起来回顾一下建筑中塑料立面设计的历史，带领大家穿越时空，共同领略建筑“时装”的美，领略建筑“时装”设计师们的别具匠心，体味带有塑料质感的建筑奇观。

Here, let's look back over the history of plastic façade in architecture, appreciate the magnificent plastic "fashion" and the creativeness of architects, and enjoy the plastic architecture wonders across time and space.

1. 古代和近代

塑料材料为合成的高分子化合物{聚合物 (polymer)}, 又可称为高分子或巨分子 (macromolecule), 也是一般所俗称的塑料 (plastic) 或树脂 (resin), 可以自由改变形体样式。它是利用单体原料以合成或缩合反应聚合而成的材料, 由合成树脂及填料、增塑剂、稳定剂、润滑剂、色料等添加剂组成的。

塑料与其他建筑材质相比, 真是一种年轻的材质。从第一个塑料产品赛璐珞诞生算起, 塑料工业迄今有百余年的历史。而塑料运用到建筑上的时间更为短暂。金属、木材、混凝土等建材的运用都能追溯到原始社会。而在塑料家族中, 唯有天然树脂的使用可以追溯到古代。树脂这一名称是由树木分泌出的脂质而得的, 天然树脂的生产受到地区的限制而产量不大, 质量也不高, 使用受到限制。



1. ANCIENT AND MODERN

Plastic is a synthetic polymeric compound (polymer) or macromolecule, commonly known as plastic or resin. It is free to change forms. It is formed by the synthetic reaction or condensation reaction of monomers, composing of synthetic resin, filler, plasticizer, stabilizing additive, lubricant, colorant, etc.

Compared with other building materials, plastic is rather young. Plastic industry has a history of over 100 years since the appearance of the first plastic product Celluloid came into being. And, the time since plastic began to be applied in architecture was even shorter. By contrast, the application of other building materials such as metal, wood, concrete, etc. can be dated back to primitive society. In the family of plastic, only the history of natural resin can be dated back to ancient times. Resin originally refers to the exudation of certain trees. However, restricted by regions, the production of natural resins was low and the quality was poor, so the application range was limited.

人们为了寻求天然树脂的代用品，1846 年用纤维素（棉花）和硝酸制得硝酸纤维素，将潮湿的硝酸纤维素与樟脑混合，制成一种混合物，常用名称为赛璐珞。它被认为是历史上最古老的热可塑性树脂，最初广泛用做象牙的代用品，并于 1872 年建厂生产。赛璐珞从发现至今已有百余年历史，目前仍在广泛使用，产品有乒乓球、玩具、梳子、纽扣等。

随着人类对塑料材料需求的增长和科学技术水平的提高，人们开发出了比天然树脂用途广泛得多的合成树脂。合成树脂是由低分子量的化合物经过化学反应制得的高分子量的树脂状物质，在常温常压下一般是固体，也有呈黏稠状液体的。第一个合成树脂品种为热固性酚醛树脂（俗名电木），它是由苯酚和甲醛在催化剂作用下制得的。但这个时期的塑料制品多是体型较小的器物，未使用到建筑上，因此，在现代之前的漫长历史长河中，塑料的建筑没有真正意义上出现。



In seek of the substitutes for natural resin, people invented nitrocellulose by nitrating cellulose (cotton) through exposure to nitric acid in 1846. Then mixing it with camphor, a compound, known as Celluloid, was formed. It is generally regarded to be the first thermoplastic, and at first widely used as an ivory replacement. In 1872, the factory specialized for this product was established. Though it has been over 100 years since the invention of Celluloid, it is still widely used nowadays, and the Celluloid products include table-tennis, toys, combs, buttons, etc.

With the increasing demand for plastic materials and the improvement of science and technology, people invented synthetic resin, which is more widely used than natural resin. Synthetic resin is resinous high-molecular-weight compound made by condensation or polymerization of low-molecular-weight organic compound. It is usually solid or viscous liquid under normal temperature and pressure. The first synthetic resin is thermosetting phenol resin (also known as Bakelite), which is formed by the catalytic action of phenol and formaldehyde. However, most all of the plastic products were small wares at this time and plastic was not applied in architecture. Therefore, plastic buildings didn't actually appear throughout the long history before contemporary times.

2. 现代

从 1907 年建立了第一个酚醛树脂厂算起，塑料便开始进入合成高分子时期。19 世纪 30 年代开始了第一批热塑性树脂和聚氯乙烯树脂的工业生产。此后合成高分子工业发展迅速，聚苯乙烯、聚乙酸乙烯酯、聚甲基丙烯酸甲酯等陆续工业化生产。目前有工业生产的约三十大类树脂。在三大合成材料（合成树脂和塑料、合成橡胶、合成纤维）中，以合成树脂生产最早、产量最大、应用最广。塑料以锐不可当的速度进入人类生活、生产的各个方面，可谓有人类的地方就有塑料。

加拿大的小伙子 Lan 在自导自演的纪录片《塑料成瘾》中，描绘了一个夸张而又现实的塑料世界：清晨，闹钟（聚氯乙烯）响起，Lan 掀起被子（聚酯纤维），穿上拖鞋（泡沫橡胶），拿起水瓶（宝特瓶）喝水，随后走进洗手间，那里有更多的塑料制品等着他……如果 Lan 的纪录片在类似本书中的塑料建筑里拍摄，将“塑料”进行得更彻底。

但如果用塑料来建房子，人们还是对塑料的强度产生疑问。其实塑料拥有的强度超过了人们的想象。例如，聚碳酸酯（俗称防弹胶），耐热、阻燃、抗冲击性能胜过砖、木、混凝土等传统建材。拿它与具有类似性能的无机玻璃比较，其耐紫外线辐射性、稳定性和成型加工性都更具优势。PC 塑料成为了很多地震多发地区抗震房子的首选建材，不会逐渐融化或突然倒塌。



2. CONTEMPORARY

Since the foundation of the first phenol resin factory in 1907, plastic has entered the era of synthetic macromolecule. The industrial manufacturing of thermosetting phenol resins and polyvinyl chloride resins started in 1930s. Hereafter, synthetic macromolecule industry has developed rapidly. The industrial manufacturing of polystyrene, polyvinyl acetate and polymethyl methacrylate started one after another. There are about 30 kinds of industrial manufacturing resins at present. Among the three main synthetic materials (synthetic resin and plastic, synthetic rubber and synthetic fiber), synthetic resin is the earliest produced, most widely used and has the largest production. Plastic has infiltrated into every aspect of human life with high speed. It can be said that where there are human beings, there are plastic products.

Lan, a Canadian young man depicted a exaggerated and realistic plastic world in the documentary film *Addicted to Plastics* directed and acted by himself. In the morning, the alarm (PVC) rang. Lan lifted the quilt (polyester fiber), put on his slippers (air-foam rubber) and picked up a bottle (polyethylene terephthalate) to drink water. Then he walked into the bathroom where there were more plastic products... If the movie was shot in the plastic buildings, like those in this book, it would be even more "plastic".

Nevertheless, people still doubt the strength of plastic if considering using it in construction. In fact, the strength of plastics is beyond people's imagination. Take polycarbonate (PC) for example. In the aspects of heat resistance, fire resistance and impact resistance, it exceeds the traditional building materials such as brick, wood, concrete, etc. Compared with mineral glass, which has similar properties, it has advantages in ultraviolet resistance, stability and formability. PC is choosed for earthquake proof buildings in many earthquake-prone areas, since it won't melt gradually or collapse suddenly.

塑料在现代人心目中，普遍还被看做是速成、廉价的代名词。特别是现代人多以各种塑料房作为简易房和过渡房，典型的有委内瑞拉巴伦西亚市成片的 PVC(聚氯乙烯塑料) 乡村别墅，那些塑料房子成型的速度快得惊人，一台机器生产一套房子的墙体只需要 42 分钟。英美等发达国家也投入大量资金研发废旧塑料铸成的塑料房，更加深了塑料房廉价、低端的印象，让人们将塑料房子作为永久性或高端住宅的可能性产生了怀疑。

书中建筑设计师显然从更高的层次入手，将塑料材质作为主角，上演了一场建筑界的阳春白雪，彰显出塑料建材在美学上和技术上的价值。本书展示的近 20 个国际最新的塑料建筑案例与大生产线上下来的粗陋划一的集成产品完全不同，它们高度艺术化且洋溢着神秘的意境，融合现代派的新颖和奇幻而不失之隐讳的语言。比如“塑料住宅”项目，使用塑料立面来营造梦幻的效果，与这栋建筑的设计理念如出一辙。聚碳酸酯板材质感轻盈，透光良好，还能将光源打散，使整个建筑变成仿佛自己会发光的半透明体，营造出浪漫温馨气氛。



In people's minds, however, plastic is still regarded as a synonym for quick and cheap. Especially, modern people build makeshift shelters mostly with various plastic. One typical example is the PVC (polyvinyl chloride) country villas in Valencia, Venezuela. The houses were built at an astonishing speed. It only took 42 minutes for one machine to produce the walls of a house. The developed countries such as US and UK invested a large number of funds in researching on building houses with recycled plastic. This further deepened people's impression on plastic houses as cheap and low-end, and therefore, making people doubt the possibility of building permanent and high-end residences with plastic.

As for the architecture projects in this book, apparently the architects started the design at a higher level. With plastic as the protagonist, they put on a fashion show in field of architecture, highlighting the aesthetic and technological value of plastic. This book presents over 20 latest plastic architecture projects around the world. Completely different from the rustic and standardized projects from production lines, they are highly artistic and bring out a mysterious sense; they are integrated with novelty and fantasy of modernism, and filled with obscurity. Take the project "Plastic House" for example. The effect created by plastic façade is in accordance with the design concept of the house. The polycarbonate sheets are light and have good optical transparency. Besides, they can also scatter the light source, thus making the building a self-luminous, translucent object, creating a romantic and warm atmosphere.