

Practical Investigation of Innovative Sustainable Fashion Design using Plastic Waste

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Abstract

In order to solve the contradiction between economic development and environmental problems, the trend of recycling strategies increases the value of textiles and other waste in the supply chain. Fashion companies have been trying to develop sustainable clothing made from post-consumer plastic bottles, but few studies have explored the practice and innovation of plastic waste in clothing design from the fashion perspective. Considering the complexity of plastic waste recycling, this article explores the possibility of upgrading and recycling plastic waste in clothing fabrics through the analysis and performance analysis of plastic waste materials. On this basis, the design hypothesis of waste plastics on the sustainability of clothing is proposed to establish the basic framework of the design. According to the design framework, two kinds of waste plastic materials are explored in the pre-experiment. Through the comparison and evaluation of the pre-experiment effect, a feasible scheme is finally selected for the overall design of a clothing series in visual display.

Keywords: Plastic Waste; Clothing Innovation Practice; Sustainable Fashion Design

In the crucial survey report “Our Common Future” drafted by the United Nations World Commission on Environment and Development in 1987, sustainability was defined as “a development that can meet our current needs without affecting the needs of future generations [1]”. As a result, many designers focused on sustainable design, and started to guide consumers to become aware of sustainability. Recycling has become a common approach in sustainable design. In the recycling of plastic waste, the production and disposal methods of plastics are mainly accomplished through the resource consumption of fossil fuels and large amounts of carbon emissions [2, 3]. This process not only causes a serious burden for land resources, but also generates microplastic particles which have unfavorable effects on the marine ecosystem [4]. In addition, plastic waste is heterogeneous

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as it contains many different polymers and product types, and it is often contaminated; much of the separated waste is not recycled into new products [5].

In the textile production process, 42 million tons of plastic textile waste was generated globally in 2015, making the textiles sector the third-largest contributor to plastic waste [6]. Unfortunately, since only about one-third of post-consumer textile waste is collected separately for reuse or recycling [7], the majority of the textile waste ends up in the residual waste and is incinerated, landfilled, or enters the environment as litter. Moreover, during the sales process of clothing, plastic is usually used as the outer packaging of fashion textile clothing, which causes further waste. Therefore, many companies and brands have realized the need to reduce waste and have begun to reintroduce the recycling of textile waste, and innovate recycling methods for plastic waste.

1 Introduction

1.1 The Status of Plastics Waste Recycling

In China, the annual consumption of plastic products is large. Waste plastic production must be equally large in order to become the world's largest recycled plastic market. Over the last 20 years, there has been a great increase in the use of synthetic, plastic-based fibers in textile production, and expectations are that both shares and absolute volumes will increase further [8]. But the recycling rate for plastics has hovered around 25%. This is lower than in foreign countries. The recycling rate of plastic waste in the United States is about 50%; the recycling rate of plastic waste in Germany is about 50%; Japan's waste plastic recycling rate is as high as 60% [9].

Waste generated during plastic production leads to complex supply chains and difficulties in recycling and sorting. The excessive production of waste emphasizes the need for innovative methods to solve unsustainable practices by returning waste to the supply chain system [10]. In the existing research, Reina Pilz proposed the term "up-cycling". That is, by changing the normal use phase of the product lifecycle, based on the recycling of waste, the original function is maximized to minimize the process, repeat, and recycling stages of the product lifecycle without going through the entire process of product planning, production, and consumption [11].

In terms of sustainable fashion design in recent years, the most common way to recycle textile waste is to extend the closed-loop of the clothing cycle through the reuse of discarded materials, and to have an impact on the clothing supply chain through recycling programs, and reuse waste clothing [10]. For example, the clothing bank founded by designer Na-yu Zhang re-examined from the perspective of "redesign", using outdated textile and plastic materials to transform and regenerate with the power of design. It gives new life to old materials, and helps to create new works to present the future of sustainable fashion [12].

In textile recycling, the recycling of plastic fibers is usually used to carry out the sustainable design of clothing. In 2019, ANTA released its environmentally friendly clothing product – the "ANTA Training" series. The raw material is recycled plastic waste bottles, using independent research and development. The physical and chemical method of polyester textiles is used to produce clothing fabrics [13]. Richa Gupta created RPET textiles (the yarn produced using this substance can be utilized instead of virgin polyester) and an Air-Dye technique to reduce fabric