Exploring the Possibilities for Reusing Plastic Bags as a Textile Material

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Shopping bags are now ingrained in our daily routines because of their low cost, diverse usage, high strength to weight ratio, and waterproof nature (Lewis et al., 2010). While these bags can be developed from various materials, such as low density polyethylene (LDPE), high density polyethylene (HDPE), degradable plastic, kraft paper, woven cotton, etc., disposable polyethylene (LDPE or HDPE) plastic bags are the most common (Singh & Cooper, 2017). Plastic bags need a huge amount of energy to manufacture, and they are made of petroleum-derived materials that can require up to 200 years to decompose; on top of that, they're only used for around 20 minutes on average (Zambrano-Monserrate & Ruano, 2020). The creation of 380 billion plastic bags and wraps in the United States is estimated to burn 1.6 billion liters of oil each year (Chen et al., 2021). These items are the representatives of the throwaway culture and are partly responsible for the degradation of nature, the change of marine ecosystems, and a negative impact on human health. In 2018, 4.2 million tons of post-consumer plastic waste (bag, wrap, sack) were produced from residential and commercial sources in the United States (Meert et al., 2021). However, only approximately 1-3% of plastic bags are recycled (LeBlanc, 2020). Since these plastic bags are not biodegradable, need a long time to decompose, and pose an acute threat to the environment, it is important to determine a suitable disposal system for these bags (Muthu & Li, 2016).

As with any other product, shopping bags can be disposed of in four different ways – reuse, recycle, incineration, and the landfill (Muthu & Li, 2016). Primary and secondary reuse are the two forms of reuse. The term primary reuse refers to items that are reused for an identical function and secondary reuse indicates that they will be repurposed for a reason other than their initial function (Bisinella et al., 2018). Ahamed et al. (2021) recommended secondary reuse as the best option to reduce environmental impact. Secondary reuse has also been referred to as repurposing. The conversion of abandoned items into useable ones is referred to as recycling. Recycling has several environmental benefits, including energy savings, resource conservation, and a reduction in the quantity of solid waste transported to landfills and incinerators. Recycling also helps to minimize greenhouse gas emissions and other negative environmental effects, resulting in more sustainable growth (Muthu & Li, 2016). However, recycling often involves chemical or mechanical breakdown of the material into its most basic component, and requires energy usage for the breakdown and re-processing. Incineration is the process of destroying waste by burning it at high temperatures in a furnace. However, it is not a generally accepted technology because of the environmental repercussions that originate from incinerators, such as the emission of carbon monoxide, carbon dioxins, and many other harmful compounds due to inadequate combustion of waste. Landfill disposal is an unfavorable alternative that causes numerous problems for our living planet (Muthu & Li, 2016). Among these, reuse is considered most advantageous to the environment and the economy because it requires no additional resources, delays discarding the product and slows necessary production of new items (Gómez & Escobar, 2022; Muthu & Li, 2016; Wagner, 2017). The carbon footprint can also be reduced up to 20% by increasing the reuse rate by 5% (Muthu et al., 2011).

Much research exists on recycling plastics, but this mainly focuses on the mechanical breakdown into plastic chips, the melting of the chips and the re-processing into new products. Often the quality of the re-processed material is lower quality than the original material and LDPE or HDPE plastic bags are not accepted in many curbside recycling programs (LeBlanc, 2020). Some creative practice-based research exists on reusing plastic bags for textile techniques such as weaving and knitting for both craft and functional purposes (Sun et al, 2020). However, no research exists regarding reusing plastic bags as sewable textile material. Therefore, the purpose of this study is to explore possibilities for reusing plastic bags as a sewable, workable textile material through creative practice-based research. Practice-based research is original investigation to gain new knowledge through means and outcomes of practices where a creative artefact is the outcome (Candy, 2006). As stated above, this would fall into the category of secondary reuse; repurposing the bags for a use other than its initial use.

The plastic bags were saved over several years after shopping trips and many were donated from friends and family. To prepare the bags, they were cut into one flat piece of plastic and the handles removed. Due to the flimsy nature of traditional plastic bags, sewing this material as it existed would only result in the plastic tearing near the seam. Therefore, the researchers decided to explore fusing the bags to create more structure for the seam.

Through the practice-based research multiple questions arose: 1) What is the best method to fuse the bags? 2) How will varying the number of layers of bags affect the end result? 3) How will the plastic behave differently when sewn as compared to sewing with traditional fabric? 4) How could the surface characteristics (color, texture etc.) be altered to mimic traditional surface design techniques?

Two methods were identified as possible heat sources for fusing; ironing, and using a heat gun. For the ironing method, the bags were placed between two layers of parchment paper and ironed on both sides in sections for 10-15 seconds per section. For the heat gun method, the gun was used at various settings and varying the number of layers. The researchers found that ironing was the ideal method for fusing and that fusing two plastic layers at a time yielded better results. Ironing on both sides of the sample helped to prevent wrinkling of the plastic. The heat gun was too difficult to regulate across the plastic, resulting in holes and uneven fusing. Samples were developed with two, four and six layers. The fewer layers, the more pliable the “fabric” was and the more layers, the stiffer the “fabric”. Two types of plastic bags were experimented with; thinner grocery bags and a slightly thicker shopping bag. The thicker bags yielded results similar to a faux leather texture when fused.

It was determined that the fused plastic in varying layers could be sewn with a regular lockstitch on a sewing machine. The nature of the “fabric” also allows for an elongated stitch length. Additionally, the “fabric” can be sewn at a narrower seam allowance and does not require a seam finish. The seam allowance can even be opened and fused to wrong side, providing even more durability. The researchers attempted to mold the bags around a dress form and fuse using a heat gun to mimic draping, but as the heat gun is more precarious than ironing, more experimentation is needed for this method.

For adding surface color, craft ink and acrylic paint were utilized. Additionally, colored plastic was cut up into smaller shapes and fused to the top layer to create a “print”. This was determined to be the most effective way to add color, although more experimentation is needed with ink, paint or possibly dye and when to apply it in the process. Also, acetone could be used to help blend or diffuse the color. Given those methods it will be necessary to add a clear layer of plastic over the top of the color additive so that the additive does not flake off. Another interesting option regarding color was to layer different colored bags and as they were fused, a mottled effect occurred blending the different colored layers underneath.

For the creation of surface texture, plastic was “wadded” and pressed from the backside to mimic gathering or other 3-D decoration such as rosettes. Pleating could also be created without basting, by fusing the top edge of the pleats in place. It was also identified that the heat gun is useful for creating a “fabric” that mimics lace. The researchers are continuing to develop this process including more experimentation with adding color, molding the plastic on a dress form and developing additional techniques that mimic other traditional surface embellishments. Future directions for this work will follow the development of a small collection of garments from this fused plastic shopping bag “fabric” using these techniques.

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