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## POSSIBILITY OF HARMLESS UTILIZATION OF CRT WASTE GLASS IN THE ART FIELD

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**Abstract:** Elevation in the electronics industry has experienced a significant increase in the amount of waste generated, resulting in the generation of a substantial amount of electrical waste (E-waste). The excessive usage and production of cathode-ray tubes (CRT), a critical component of older monitors and screens, has become a significant environmental issue globally over the past few decades. With the advent of novel technologies, CRTs have been almost entirely replaced. It is now essential to develop new and renewable methods to manage CRT glass waste. The reuse of CRT waste glass for the manufacturing of new products or as an admixture to existing ones presents a significant opportunity, and thus it is obligatory to find contemporary ways to recycle this waste. Grounded CRT waste glass has been found to have a positive impact when used as a fine aggregate, but it is classified as hazardous due to its high lead content. However, after comprehensive series of cleaning and grinding the utilization of CRT glass can be beneficial in various fields. This paper focuses on reviewing recent developments related to the reuse of CRTs, and the aim is to evaluate the feasibility of its safe application in the art field.

**Keywords:** e-waste, cathode-ray tubes, sustainable development, art

### 1. INTRODUCTION

The growing production and disposal of electronic waste, or e-waste, is a significant environmental problem worldwide (Singh et al., 2016). A major contributor to this issue is the excessive use and production of cathode-ray tubes (CRTs) in older electronic displays before the development of thin-film transistors (TFT) and liquid crystal displays (LCD). Based on data from the waste electrical and electronic equipment (WEEE) collection and pretreatment market, it has been estimated that Europe currently collects approximately 50,000-150,000 million tons per year of discarded CRTs, and this volume is not anticipated to decrease in the next several years (Andreola et al., 2007). Since CRTs have been almost entirely replaced, there is a pressing need to find new and sustainable methods to manage the hazardous glass waste they generate.

Environmental concerns such as the need for energy efficiency and the conservation of natural resources have highlighted the importance of developing a "circular economy" (Li et al., 2022). With over 40 billion tons of aggregates consumed each year, finding alternative solutions to replace natural resources is crucial (Peduzzi, 2014). Extraction of these resources

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can have significant and long-lasting impacts on the environment, including water supplies, ecosystems, and wildlife (Hui & Sun, 2011).

Glass waste has considerable potential for recycling and reuse due to its versatile composition and various forms and appearances. In theory, it is entirely recyclable. However, if glass waste contains impurities, is broken, contaminated, or is mixed in color, it becomes impractical to recycle through the re-melting process. Recycling glass waste can help to mitigate environmental impacts and reduce the amount of waste that takes a long time to break down naturally (Bisikirske et al., 2019).

Recent studies have shown that CRT glass waste can be used as a sustainable alternative to traditional materials, such as in the construction industry. The strength and low water absorption of CRT glass make it an ideal material to use as sand or pozzolan in construction materials (Walczak et al., 2015). Repurposing CRT waste glass in innovative and visionary ways offers both artistic and ecological benefits.

This paper explores the potential of the usage of CRT glass waste in the art field, focusing on its unique properties, benefits, and challenges, as well as notable examples of its implementation in art and design. The paper also discusses the environmental impact of e-waste and the potential of CRT glass waste to address sustainability challenges in the art industry. By doing so, this paper aims to contribute to the understanding of how waste materials can be repurposed to create meaningful and sustainable works of art.

## **2. IMPLICATIONS**

### **2.1. Ecological Implications**

The appropriate management of CRT glass waste is a significant environmental challenge due to the presence of hazardous materials such as lead and phosphor, which can contaminate the environment if not disposed of correctly. Incorrect disposal of CRTs can result in soil and water pollution, posing risks to human health and wildlife. As concerns about the environmental impact of e-waste continue to grow, there is an increasing interest in repurposing CRT glass waste as a sustainable alternative (Yao et al., 2018).

The use of CRT glass waste in art and design projects can have ecological benefits by diverting waste from landfills and reducing the need for traditional materials like cement or ceramics. It is known that incorporating CRT glass waste into construction materials can also reduce greenhouse gas emissions since it requires less energy to process than traditional materials (Dachowski & Kostrzewa, 2016). This also can be applied in the art domain as well, because the materials that are conventionally used and mixed with CRT waste glass can have similar properties like ceramics, sculpture, glass artwork, etc. Additionally, artists can raise awareness about the issue of e-waste and promote sustainable practices by using CRT glass waste in their work.

However, utilizing CRT glass waste in art and design also presents challenges. One major concern is the potential release of hazardous materials during the process of repurposing CRT glass waste. Researchers have developed different methods to safely handle and process CRT glass waste, such as using a mechanical crushing process to produce fine glass powder (Ling & Poon, 2011). It is also essential to consider the longevity and durability of artworks made from CRT glass waste to ensure they do not contribute to further waste generation in the future.

Despite these challenges regarding the utilization of CRTs, there are remarkable examples of artists and designers creatively incorporating waste glass into their work. Canadian artist Brent Crothers, for instance, creates sculptures that showcase interesting symbiosis of electrical and waste glass, while calling attention to the issue of e-waste. In architecture, Superuse Studios

has used crushed glass waste as an aggregate in concrete to produce a sustainable facade for a building (Vestergaard & Jiménez, 2020).

Moreover, the incorporation of CRT glass waste in art and design offers a promising opportunity for the advancement of a circular economy. This economic model prioritizes the sustainable utilization of resources, where waste is minimized, and materials are kept in use for as long as possible. By reusing waste materials such as CRT glass to create new and valuable products, artists and designers are promoting a circular economy and minimizing the burden on natural resources.

Apart from the environmental benefits, the use of CRT glass waste in art and design can also bring about social and cultural advantages. It can promote the preservation of cultural heritage by incorporating discarded CRT glass from historical artifacts or buildings into artwork. It can also create economic opportunities for communities involved in the collection and processing of e-waste.

The repurposing of CRT glass waste in the art field is a flourishing and thrilling avenue for sustainable innovation. By adopting responsible practices and embracing the unique characteristics of this material, artists and designers can contribute to a more sustainable future while creating exceptional and meaningful works of art.

## **2.2. Ethical Implications**

The repurposing of CRT glass waste in art and design poses ethical challenges that must be addressed. One of the foremost concerns is ensuring the safety of workers who handle and process CRT glass waste. Exposure to hazardous materials such as lead can have serious health consequences, making it crucial to implement sufficient safety measures to protect workers' health (Pauzi et al., 2019). Additionally, ethical issues related to fair labor practices and responsible sourcing of materials must be taken into account.

Another ethical concern with the use of CRT glass waste in art and design is the risk of greenwashing, which involves making false or misleading claims about a product or service's environmental benefits. It is essential to ensure that the repurposing of CRT glass waste is not a mere marketing tactic, but a genuine effort to promote sustainability and reduce e-waste.

To address these ethical concerns, several organizations and initiatives have emerged to promote responsible practices in the recycling and handling of electronic waste. For example, the e-Stewards certification program sets standards for responsible recycling and handling of electronic waste, including the protection of human health and the environment. Similarly, the Global e-Sustainability Initiative (GeSI) has created guidelines for the responsible sourcing of materials, including electronic waste (Airike, 2016).

In the art world, organizations such as the Sustainable Arts Foundation promote sustainability in the arts, including the use of recycled materials. Artists and designers should consider the ethical implications of their work and strive to uphold responsible practices when repurposing CRT glass waste.

In summary, repurposing CRT glass waste in art and design presents ethical challenges, but it also offers opportunities to promote sustainability and responsible practices. By implementing sufficient safety measures, maintaining fair labor practices, and avoiding greenwashing, artists and designers can contribute to a more ethical and sustainable future.

## **2.3. Artistic Implications**

The use of CRT glass waste in art and design presents unique artistic implications that can contribute to a more sustainable future. By incorporating discarded electronics into their

work, artists have the opportunity to create pieces that reflect our society's relationship with technology and e-waste. The use of unconventional materials can also challenge traditional notions of art and expand the possibilities of what can be considered artistic expression.

One example of the use of waste glass in art is the work of artist Josh Simpson. Simpson creates intricate glass spheres that incorporate various materials, including CRT glass waste. His pieces reflect both the beauty and the environmental implications of our technology-focused society. Another artist, Jeremy Mayer, uses the parts of discarded typewriters and other machinery to create detailed sculptures, including a life-size human figure.

The use of CRT glass waste in art offers an opportunity to explore environmental, technological, and societal themes while promoting sustainable practices. As artists continue to experiment with repurposed materials, it will be interesting to see how this trend shapes the future of art. For example, artist Nathaniel Stern's interactive installation, "The Giverny Series," uses old televisions, monitors, and computers to create a digital garden in which viewers can immerse themselves. The artwork invites reflection on our relationship with technology and nature and how we can create more sustainable futures.

However, there are also artistic implications related to the use of CRT glass waste in art. The incorporation of hazardous materials into art pieces raises questions about the long-term preservation and conservation of the artwork. Additionally, the use of materials such as CRT glass waste may limit the accessibility of the artwork, as not all galleries or collectors may be willing to handle potentially hazardous materials.

To address these concerns, some artists and organizations have developed strategies for handling and processing CRT glass waste responsibly. For example, artist Dan Chen uses a sandblasting technique to remove any hazardous materials from the waste glass before incorporating it into his sculptures. The Sustainable Arts Foundation promotes the use of recycled materials in art and provides resources for artists to incorporate sustainable practices into their work.

Overall, the use of CRT glass waste in art and design presents unique opportunities and challenges for artists and designers to explore environmental, technological, and societal themes while promoting sustainable practices. By continuing to experiment with repurposed materials, artists can push the boundaries of traditional art and contribute to a more sustainable future.

### **3. CHALLENGES AND LIMITATIONS**

One of the primary challenges of incorporating CRT glass waste into art is the potential health risks associated with handling hazardous materials. CRT glass typically contains substances such as lead, which can pose a threat to artists and others who work with the material. As a result, artists who are interested in using CRT glass waste in their work may face significant barriers to entry, including the need for proper equipment and facilities to ensure safe handling. Furthermore, the presence of potentially hazardous art materials can also act as a deterrent for galleries or collectors to showcase or acquire certain artworks. As a result, this can restrict the public's access to these pieces, which can have significant implications for the preservation and accessibility of such works of art, as well as for the artists who create them.

Another challenge associated with the use of CRT glass waste in art is the limited availability of the material. As CRT technology has become outdated, the supply of CRT glass waste has decreased, making it difficult for artists to obtain the necessary amount to complete their projects. Legal restrictions on the disposal and transportation of hazardous waste, including CRT glass, can also pose significant challenges for artists seeking to obtain the material (Williams et al., 2008).

Furthermore, the incorporation of CRT glass waste into art can raise questions about the long-term preservation and conservation of the artwork. The material is not designed to last for long periods, and the inclusion of hazardous substances can make it difficult to ensure the preservation of the artwork without risking the safety of those who handle it (Premalatha et al., 2014).

Despite these challenges, some artists have found innovative ways to use CRT glass waste in their work. For example, Marpi Studio has created interactive installations that explore themes of technology and e-waste, incorporating glass waste into the work. Similarly, artist Laura J. Lawson has used glass waste to create intricate sculptures that comment on society's relationship with technology and consumption.

Overall, while using CRT glass waste in art presents challenges and limitations, it also offers opportunities for artists to explore environmental themes and promote sustainable practices. As more artists experiment with repurposed materials, it will be essential for the art world to consider the health risks and environmental implications associated with these materials. By doing so, artists can continue to push the boundaries of what is possible with e-waste, inspire others to consider the environmental impact of their practices and contribute to a more sustainable future.

#### **4. CONCLUSION**

Aside from its artistic implications, repurposing CRT glass waste in art can have a significant impact on sustainability and the environment. By finding new uses for this material, we can reduce the amount of electronic waste that is improperly disposed of, ultimately lessening its negative impact on the environment.

However, as previously mentioned, there are also ethical and health concerns that need to be addressed when working with hazardous materials like CRT glass waste. It is essential to manage the potential risks associated with handling these materials carefully, and artists must prioritize the health and safety of those who work with them.

Despite these challenges, the growing interest in using CRT glass waste in art presents an opportunity for creative solutions to environmental problems. Through their work, artists, designers, and researchers can promote sustainable practices and encourage others to reflect on the environmental impact of their own practices.

Moving forward, it is crucial to continue exploring the potential of CRT glass waste in art while also being mindful of the ecological and ethical implications of this work. By doing so, we can promote more sustainable practices in the art world while also inspiring new and innovative forms of creative expression.

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