Architecture & Urbanism in the Age of Planetary Crisis

AU2020 International Conference
Proceedings, ECODEMIA, LONDON 2020

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Editor: Dr. Senem Zeybekoglu
Published By: Commons Books, Ecodemia
ISBN: 978-1-304-56797-0

COMMONS books

ECODEMIA
AN ETHICAL & SOCIO-ECOLOGICAL ACADEMIA

TABLE OF CONTENTS

25. Transform to Transform Ourselves

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Crisis and plastic consumption

The current sanitary crisis that we are globally facing has accelerated a wide range of issues and problems related to the reproduction of our consumption culture.

One of these problems takes our relation with industrial objects, especially plastic ones. In this sense, from the pandemic mitigation efforts, a large increase in the demand of plastic products has been detected to protect citizens, patients and health workers [1].

As can be seen in Fig.25.1, objects like masks, gloves, medical lab coats, glasses and facial masks faced an exponential growth in their demand and, according to that, the amount of plastic waste has been multiplied. On the other hand, it is also possible to find medical hardware like respirators and ventilators, polycarbonate syringes, etc., that also increased in demand, but they have longer useful life compared to the first group [2].

Figure 25.1: Hospital plastic waste. Source: Elaborated by the authors from The conversation, journalistic flair.
Link: https://theconversation.com/danos-colaterales-de-la-covid-19-el-resurgir-del-plastico-137803

According to the prevention measures that have been adopted by the governments, like confinements and limit free walking, the use of disposable plastic has increased linked to the demand of delivery services packaging products to avoid personal contact.

What can we do with this plastic waste?

Definitely, this leads us to the ecological crisis reported in the last years related to the plastic waste in our planet and to the social, economical and environmental paradigm of single use industrial objects. The new industrial production paradigms based on ecodesign and circular economy methodologies have raised like a viable way between many production politics in the world, however, design and developing products and objects from recycling materials continues to be an urgent challenge.

From waste to the transformation

In this context, the plastic products post-use destiny (from health systems and general use), remains a feeble domain for institutions and citizens. In Chile, the regulatory framework for waste in health system buildings contemplate that 2,687,040 medical plastic waste are eliminated daily [3], an critical figure covered by a regulatory framework, which, although it contemplates the

differentiated use of waste containers and operating recommendations aimed at its recycling and reuse, does not specify any of these operations, promoting actions such as the collection of these or the incineration of waste or garbage dumps, which could generate emissions of carcinogenic compounds such as dioxins and furans [2].

According, recycling to transform, and limiting virgin raw materials as much as possible, is an aim that will allow us to revalue plastic waste as a secondary raw material open to the redesign of our material culture. Based on repair, modification and adaptation.

Re-thinking the plastic waste

From mechanical recycling to manufacturing, a technological community

Within the possibilities of exploring and understanding a recovery of plastic waste to the production cycle, our research is part of a design process for new architectural materials, taking as a first parameter the mechanical recycling process of different types of plastics obtained from the post-consumer, and the stabilization of new materials with additives that enhance certain properties of new products.

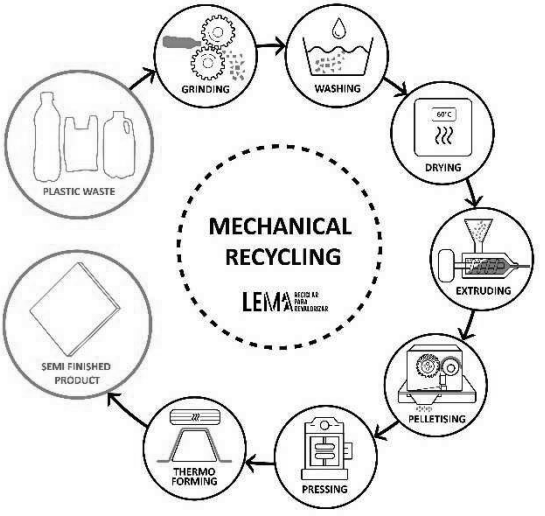

Figure 25.2: Mechanical recycling processes. Source: Elaborated by the authors from ISO 15270, 2008.

As shown in Fig.25.2, the transformation of these mechanical processes are enunciated within an interdisciplinary area, which involves new methodologies and techniques, to follow the line of revaluation of materials and products in search of a comprehensive transformation of the new product.

LEMAA is a Laboratory of Environmental Architectural Materials Exploration; in this laboratory, we give an opportunity to waste materials, incorporating Architecture, Design and Chemical Engineering, to create new forms and functions from the materialization of new products. We use the mechanical recycling process, such as crushing, washing, drying, extrusion, pelletizing, pressing, thermoforming and injecting to obtain a new functional and recycled product. Finally, we incorporated Ecodesign methodologies, to evaluate the environmental impact in the different stages of the product (Fig. 25.3).

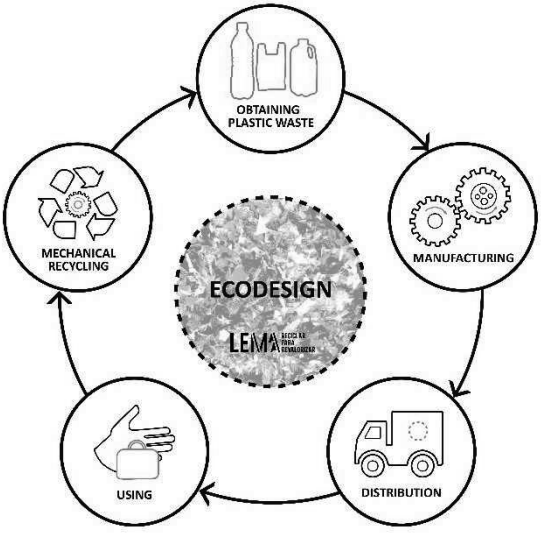

Figure 25.3: Ecodesign methodologies. Source: Elaborated by the authors, 2020.

Nanomaterials as an opportunity

By exploring and understanding the opportunity that plastic waste has for the production cycle, additives allow the enhancement of additional characteristics or properties to the new material, being able to grant a new environmental functionality to the architectural product as the degradation of polluting gases through Photocatalysis for example.

The iteration in this exploratory process of creating a new material, frames us to the possibility of researching the stabilization of the mixture together with catalytic nanoparticles, as can be seen in image of Fig.25.4. making a new nanomaterial with environmental functions.

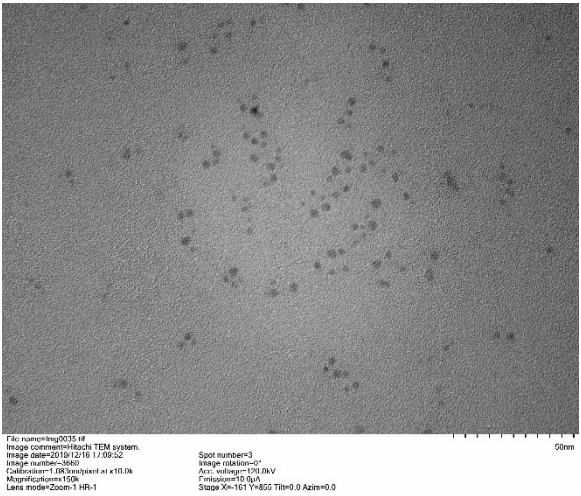

Figure 25.4: Catalytic nanoparticles in recycled plastic. Source: Elaborated by the authors from SEM (Scanning Electron Microscopy) test carried out by the USACH laboratory

The assessment of the incorporation of these additives in thermoplastics, the stabilization and the dosage percentage are taken into account to ensure a stability and minimum resistance compatible with the mechanical ranges [4]

Conclusion

Highlights of the critical consumption of plastics used on pandemic, invite us to transform ourselves, from an exploratory and iterative process of trial and error. This path allows us an opportunity for the environment that entails the change of the definition of plastic as a waste.

The incorporation of technologies, such as mechanical process, nanomaterials and ecodesign, allows to revalue plastic waste through the composition and materialization of new innovative products through interdisciplinary areas.

Plastic waste has a potential for toxicity, and added to the slow degradation, has been identified as a risk to human health and ecosystems [5]; according to the cycle of this material, it's a real challenge, transform the design methodology of new materials that will allow us to repair, modify and adapt what exists.

Acknowledgements

Environmental Architectural Materials Exploration Laboratory (LEMAA), School of Architecture, University of Santiago, Chile.

Polymers Laboratory (POLILAB), Faculty of Chemistry and Biology, University of Santiago, Chile.

Centre for Nanoscience and Nanotechnology (CEDENNA).

The study received funding from the National Commission for Scientific and Technological Research (CONICYT/FONDECYT), project no. 11180461.

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