CLIMATE DETECTIVES 2021 – 2022

MASK-CONVERTER

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RESEARCH QUESTION

Did you know that the weight of the masks we throw away in Spain in just one day equals the weight of 260 elephants? Do you know the effects this waste means for our environment? Can we

SUMMARY OF PROJECT

In this project ,we have done an investigation about recycling the plastic we find in masks.
This investigation started when we realised that a really big amount of masks were thrown away every day. This is very worrying as most of the waste is or has plastic (polypropylene) parts which impact the ecosystems negatively.
It has become a serious environmental problem as masks need around 200-300 years for decomposing.
For this reason we decided to create a method to recycle the plastic from these masks.
Firstly we separated the plastic from the fabric playing with densities in order to give a new life to the plastic. Later we tried to melt the plastic and we also tried a better option as it doesn't use energy, compressing the plastic.
We introduced the plastic into the cube, but we found that the density of the object was lower than the density of a human bone. For that reason we decided to introduce plastic from bottles, called PET, to increase the density of the object. As we discovered this method we realised that we can create any object with any density by filling the cube with the plastic from the masks or any common plastic. We just need to use a 3D printer to create a mold.
So we can fill it with different types of plastics and in different proportions until the required density is obtained

Figure 1: Mask reuse proposals

MAIN RESULTS

At the beginning we tried to separate the plastic from the fabric. We were based on the density of both components. We realised that the density of these materials is different and that meant plastic would float in a solution whereas fabric would sink. To separate the filters (which is what we melted) from the mask fabric we used distilled water and 96% ethyl alcohol. Finally we managed to separate them using a mixture of 1 ml of distilled water and 62 ml of ethyl alcohol. We calculated the quantity of the liquids for the solution by trial and error and we could finally separate them.
We designed a cube with Tinkercad and printed it with a 3D printer. This cube was to be filled with the melted plastic to simulate a prosthesis.
We thought of 3 methods to recycle it:
a) With an alcohol burner or a Bunsen burner.
b) With a heat gun and an aluminum funnel to keep it warm during the process.
c) Compressing the mask plastic by the compression method.

The density of the cube filled with polypropylene and PET had to be equal to the density of a human bone.
Our main objective was to prove that the plastic in masks can be used to create prosthesis for bones. To do this, we needed to match the density of the cube with the polypropylene to the density of a human bone.
Although we did not achieve one of our objectives – to match the density of the cube with the polypropylene to the density of a bone – we achieved these goals:
a) We can melt the plastic of masks to reuse it by using a heat gun or by the compression method.
b) We can print a cube with a 3D printer to simulate a prosthesis.
c) We can insert the melted polypropylene into the 3D cube.
d) We can insert the polypropylene by the compression method, without melting it.

To conclude, the first aim we set was giving a new use to masks. We can say that we have achieved it.

By reusing only the plastic we find in masks, we can't create prosthesis for human bones. But we're working on that already.

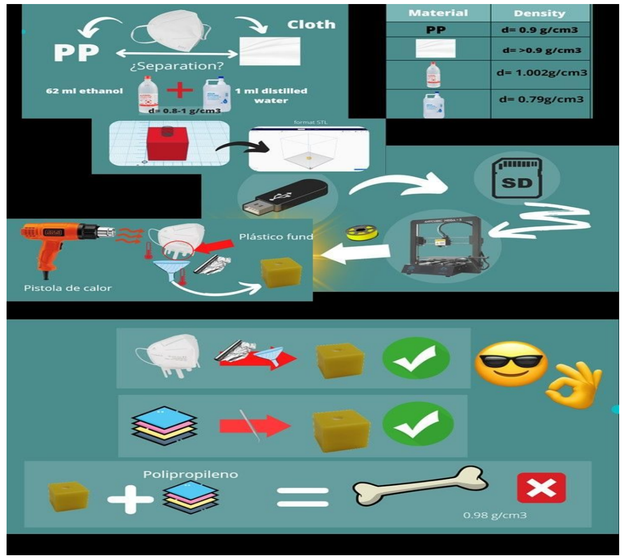

Figure 2: Separation process of plastics and fabric, hollow part with 3D printer and determination of density of the obtained part

ACTIONS TO HELP LESSEN TO THE PROBLEM

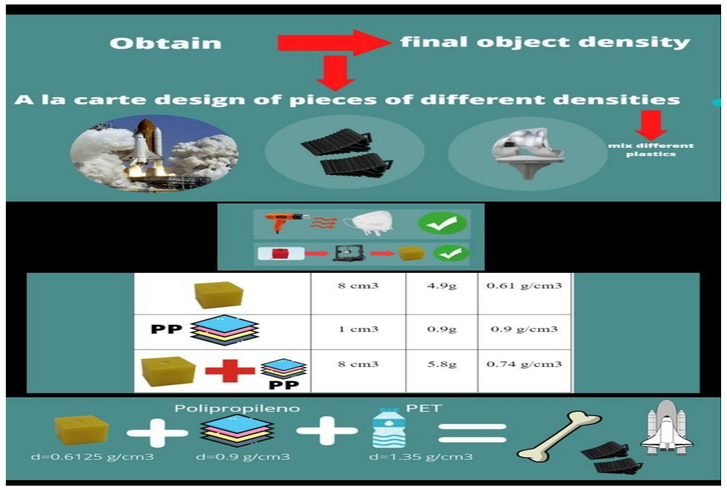

Figure 3: Proposals for the future: using waste to design parts for space travel

We will prove that we can not only create prosthesis but also create objects with customised densities depending on the amount and type of plastic that is added.
If we can match the density of the cube to any other body's density, the plastic could be used for any type of use such as parts of cars or, even, spaceships .With this, there is the possibility of creating eco-friendly replacement parts companies using the recycling methods we used in this project to reduce the CO2 emissions that are caused by the manufacture of plastic.
The benefits of our research are numerous as the reuse of mask plastic will decrease the production of plastic and, on the other hand, it won't be thrown out. We can see these three main advantages:
a) We will save fossil fuels, a limited resource.
b) The disposal of plastic will be reduced and this involves the reduction of pollution in the ecosystem.
c) Reusing the plastic masks will create new products useful for humankind.