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Eco-friendly material for packaging

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Introduction

At the moment there exists a predominant prevalence of the combined packaging (i. e. cardboard is covered with polyethylene) in the food packaging market, which provides the necessary barrier properties for a packaged product. However, there also exist a great number of problems regarding the issue such as packaging sorting, recycling, waste management, and economic losses.

Water and air pollution have reached critical levels in much of the world's cities. Consequently, the chemicals in question are intensively depleting the ozone layer of our planet. Thanks to the scientists and the efforts of environmentally friendly institutions, the public is educated and encouraged to nurture nature, to understand its importance and potential threats. In the face of increasing education and human soprano about the importance of ecology, it can be assumed that people will pay even more attention in the future organic materials, for example, will choose a product that will be labeled as biodegradable packaging. In this case, the label that decomposes in an extremely fast time, instead of standard labels/packaging with a decomposes time of even a few hundred years.

MMK cardboard can be called a revolution in the industry of packaging. Until now, packaging which has direct contact with food must be laminated with films such as PE. Plastic waste is one of the most common types of waste that takes a very long time to decompose. Normally, plastic packaging can take up to several hundred years to decompose in landfills, while cardboard is easily recyclable and takes up to half a year to biodegrade.

Problem Description

The aim of this research is to investigate the physical and mechanical properties and characteristics (in order to offer analog materials in the perspective) of the new materials with the necessary properties and compared to the properties of the most using materials.

Methods

The experimental investigation of bending was chosen for that to understand which cardboard as a raw material has the highest resistance on bending fatigue and also that to compare MMK cardboard mechanical properties to other most frequently used cardboard in the packaging industry. The following cardboard samples were compared to each other:MMK cardboard 305 gr/m^2; ARKTIKA cardboard 305 gr/m^2 – it is GC1 grade cardboard with multiple structures and a double coating on the topside and one layer of coating on the backside, and is printable on both sides [1]; Ensocoat cardboard 305 gr/m^2 – one side fully coated board with a light coating on the reverse [2]; Korsnäs White cardboard 305 gr/m^2 – it is coated cardboard and made out of 100 % virgin fiber (double-coated on the top side and single-coated on the reverse side) [3].

Results

From the study, we can conclude that the samples cut in the machine direction (MD) of the fibers are on average 12% stronger than the cross direction (CD) and withstand a higher number of bending cycles. This is because specimens that are cut in the CD direction of the fiber are bent parallel to the fibers, so they break faster.

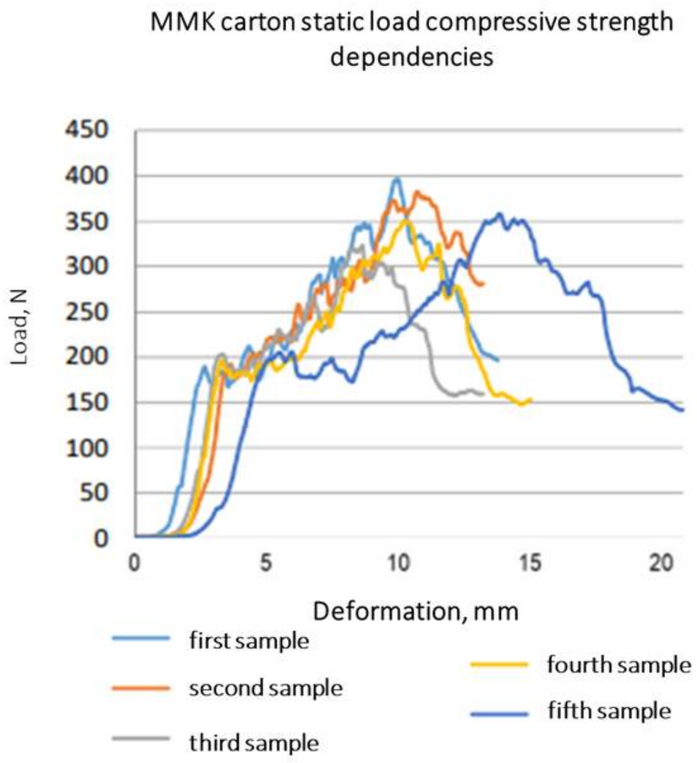

Figure 1

MMK carton static load compressive strength dependencies

As we can see from the graph for all five analyzed packaging results are similar. Initial deformation for MMK carton was observed when Fcritical = 195.6 N (19.56 KG).

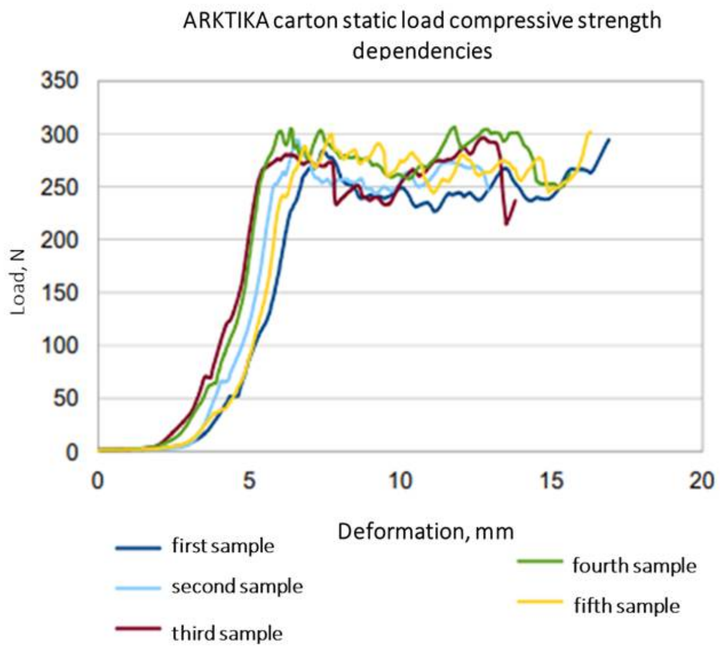

Figure 2

ARKTIKA carton static load compressive strength dependencies

As we can see from the graph, all five ARKTIKA analyzed packaging showed similar experiment results. The initial deformation was observed when Fcritical = 300 N (30.00 KG).

After performing a crushing test the same size packages, we can conclude that MMK cardboard is less resistant than one of the main packaging raw materials – ARKTIKA cardboard. The graphs show that MMK cardboard can withstand 104.4 N (10.44 kg) less load than ARKTIKA cardboard.

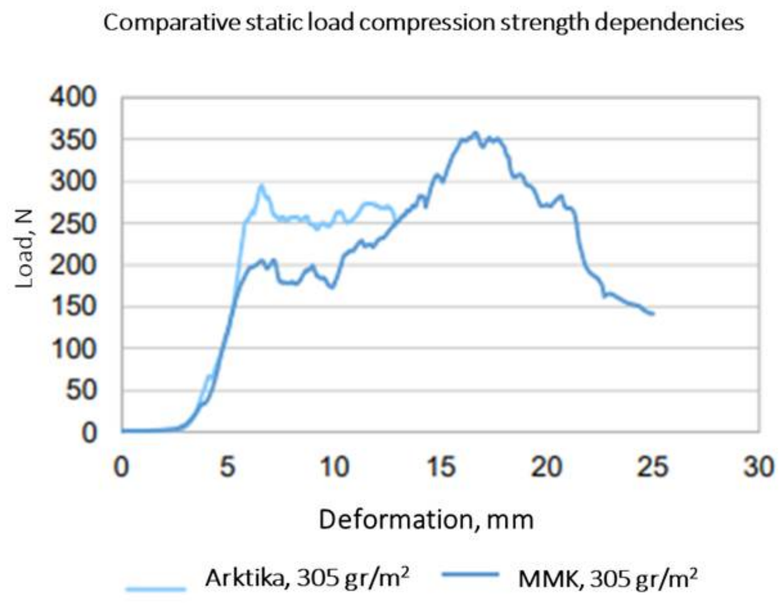

Figure 3

MMK and ARKTIKA carton static load compressive strength dependencies

Discussion / Conclusion

From the mechanical compression and bending experimental results, we can clearly see that the mechanical effect of the biodegradable MMK cardboard is weaker than the other ordinary materials using in the packaging industry. Decreased strength was shown in the bending test (~ 30 times less resistant than other specimens) and the crushing test (~ 10 kg less resistant to load).

However, it is worth considering the growing ecological problem. Primary food packaging that does not require additional PP coating and is biodegradable is better than now ordinary using packaging with PP. And analyzed packaging's are suitable for light products and results show that the critical force it's enough the strength of these types of packaging.

An ecological solution to start using MMK cardboard as a raw material for food packaging would raise the company's reputation vis-à-vis customers and direct competitors, and the company could call itself an environmental organization and thus attract new customers.

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