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Briefing Paper (Original of the Briefing Paper, please see the german version)

Environmental assessment of expanded perlite from the Bublon company

In terms of the impact of the product on climate, the technology utilised by Bublon is at a leading world class level.

Depending on the origin of the raw material and the size of the plant, the carbon footprint (as a measure of global warming potential and impact on climate) is around 180 - 210 grams of CO_2 equivalent per kilogram of expanded perlite. This is significantly better than the world average of more than 1 kg of CO_{2e} and even below the values of approx. 250 grams given for Switzerland, which is exemplary in this respect.

(To put this in context: 180-210 grams of CO_{2e} are equivalent to the impact of driving an average mid-size car for one kilometre.)

In addition, there is a considerable potential for further CO_2 reduction, which could be achieved by using electrical power sources with a lower environmental impact. In the optimum case, a further halving of the footprint is conceivable.

But even as it currently stands, in terms of carbon footprint the product is clearly superior to all functionally similar materials, be it mineral foam glass or fossil-based or biogenic materials! For example, the value for foam glass lies between 1000 and 1500 grams of CO_{2e} and the value for bio-based materials (such as "Biofoam" from PLA) is even a little higher!

For the fossil-based insulation materials EPS and XPS, the values of 3.5kg and near 10kg respectively are 15 to 40 times higher!

Please note, however! The references in the literature refer to one kilogram of product. A final meaningful comparison is only possible using the same unit functionality, (e.g., per cubic meter or per measure of thermal insulation performance), but considering the large differences, there will still be a clear advantage for expanded perlite.

A further relevant aspect impacting the ecobalance is the reduction that is most certainly present (though not specifically quantified in the context of the study conducted) of other active categories such as photochemical ozone formation, acidification, particulates, carcinogenic and non-carcinogenic effects, and in particular compared to biogenic materials, the very low land consumption and the virtually negligible impact on biodiversity.

And last but not least, at the end of the life cycle the benefits of the inert nature of this mineral material will be advantageous, and in addition can lead to significant cost reductions, (especially when measured against the, sometimes problematic, disposal of EPS and XPS).

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Furthermore, the declared aim of reducing microplastics, (see for example: recommendation of the ECHA and the decision of the European Parliament 2018), opens up an area of great interest for application in cosmetics, medicines and detergents.

Due to the comparably small amounts utilised in these areas of application (only approx. 1000 tonnes of particulate microplastics are accounted for in Germany each year), only small gains can be achieved in terms of climate protection. However, avoiding the deliberate release of microplastics and their still largely unknown consequences for health and nature remains a goal that is worthwhile pursuing!

<u>Use as filler in HDPE:</u>

Replacing 10% (by weight) of HDPE with perlite spheres (Type Scenario B3) could reduce the carbon footprint of the finished product by some 10%.

Here it is important to note that: Every addition of foreign substances into plastics makes the material less recyclable (up to the material becoming non-recyclable!)

As the utilisation of HDPE to HDPE recyclate can save up to 40% of the carbon footprint, use in short-life materials (such as packaging film) therefore makes much less sense. This also applies, even if the proportion of HDPE, which is actually recycled today, is still very low! In particular, in view of the EU determined goal of a closed-loop economy, it would be altogether undesirable to reduce the recyclability of plastics by adding inorganic materials. (Possible exceptions to this are: Weight reduction in very durable parts, e.g. aircraft industry)

<u>Potential further applications in addition to pour-in insulation:</u>

In contrast to this, applications of the material as a pure substance appear very promising, especially if the insulating property of perlite spheres brings an added benefit. For example, using it as a mouldable material for packaging in which the impact and/or heat-insulating properties of the material make the effort worthwhile (a replacement for Styrofoam cups).

In terms of protecting the climate, applications for moulded parts in the construction industry appear to be of particular interest (insulation panels could replace XPS).

[Note here also the good results of foam glass in the renovation of the TU building in Strohmayergasse! Comparable components made with Bublon raw material would improve the life cycle assessment for this thermal renovation by an additional 19%! The proportion of insulation material in the carbon footprint of the total renovation would be reduced from approx. 25% to 8%. (Based on assumption: the processing of perlite spheres into internal insulation panel adds 100% CFP to that expended in production of the spheres. (This could well be a lot less too.)) To what extent such applications are also technically feasible for the perlite spheres should be investigated.]