Can enamels' environmental impact truly be reduced?

June 7 2013, by Sorina Buzatu

Recycling the toxic fluoride by-products from the ceramic and enamel industry into high-quality reusable material reduces the process' environmental impact, but their end of life disposal remains problematic.

Enamel cookware is ubiquitous. The trouble is that enamels—like other vitreous substances, or frits, used in making porcelain or ceramic glazes—are produced through a process generating highly toxic chemicals. One of them is a fluoride derivative present in the form of hidroflouric acid in the flue gases from smelting furnaces. This chemical interacts with lime particles and turns into a by-product called

micronised fluoride lime (MFL). If the reaction is controlled, it yields a quality material that is highly homogenised and therefore suitable for reuse in production of new frits and high-quality ceramic products.

The Slovenian company EMO-FRITE has now found an innovative solution to reuse this by-product, as part of an EU funded research project called FRIT-REC. The material can also be used to enamel steel sheets or cast iron, thus giving them a mat surface. "We managed to change an unusable-hazardous waste from the production of frits, to a usable one," Nada Bozicek, the project coordinator, tells youris.com. She is in charge of quality control at EMO FRITE, in Celje, Slovenia.

This approach is designed to mitigate the environmental impact of the process. Not only by reusing of by-products, but also by lowering its energy consumption. "Before the implementation of this technology we produced 130 tonnes of hazardous waste yearly, whereas we expect this value to decrease by 90% by [the end of the project in October 2013]," she adds. What is more, the technology allows savings in the bills of electricity, fuel and waste management. "For us, it means a considerable reduction of 4 % in the overall costs for production," she explains.

One of the innovative parts of the new process is that it provides a dry purification system. This means that it produces almost zero waste and removes the problem of the waste water other processes have. "We use a dry purification system to eliminate the impurities, so this by-product has a more stable and constant composition," Bozicek says. This makes it suitable to be reused once reduced in micrometric scale particles, in its micronised form. "We still have to make some improvements in the optimisation process, but when the MFL reaches the right composition, all of it can be reused," she adds.

The advantage of such novel recycled material is that "it assures a good covering, resistance to boiling water and good adherence. [These

properties make it] an important raw material for newly developed electrostatic powder enamels", explains Bozicek. This type of coating displays higher chemical resistance than conventional ones.

Waste recycling is a common procedure in the glass and pottery industry. "As a technological waste, MFL can be recovered and reintroduced in the industrial recipe", which is a great advantage for the environment, according to Ovidiu Omota, production manager at Sanex-Lasselsberger Group, a ceramic tiles producer based in Cluj Napoca, Romania. "I cannot appreciate its level of toxicity, but there are clear regulations for the use of the toxic substances like fluoride and I am sure they are under strict monitoring", said Omota.

The new process may result in a reduction in enamel and ceramics' environmental impact. However, other scientists consider the use of these highly toxic chemical problematic as they pose health hazards. "In the glass industry, people work a lot with fluoride," points out Nicolae Toma, a professor of applied chemistry and materials science at the Polytechnic University in Bucharest, Romania, adding: "People [working in the ceramic and glass industries] risk getting sick of osteoporosis if they are exposed to [high levels of] fluoride." Toma tells youris.com: "The fluoride passes through any material, dissolves any rock." The only solution for such waste at the end of their life, he believes, is setting it into concrete and burying it into the ground.

Provided by Youris.com

Citation: Can enamels' environmental impact truly be reduced? (2013, June 7) retrieved 23 June 2024 from https://phys.org/news/2013-06-enamels-environmental-impact.html