

# Magnesium production in Romania for Europe's industries

The recently funded EIT Raw Materials "EU Magnesium" project (number: 21105) will be the first domestic magnesium (Mg) production in Europe. Magnesium is a critical raw material for manufacturing light weight aluminium magnesium (AlMg) alloys, in particular for the automotive and aerospace industries.

By Beate Orberger, Géosciences Conseils-Catura Geoprojects

Pure Mg is the lightest engineering metal (1.74 g/cm<sup>3</sup>), 33% lighter than Al and 75% lighter than steel. Compared to Al, Mg has a higher strength-to-weight ratio, and shows better ductility, castability and thermal and electrical conductivity. Electromagnetic interference reduction is another quality of interest. Magnesium is not toxic and therefore safe to work with.

Mures Magnesium SRL is set to bring about 20,000 tpy of Mg to the EU market by 2026, representing 13.5% of the EU's Mg requirement. Furthermore, 82,000 tpy of CaCl<sub>2</sub> and, in the first 9 years, 8,200 tpy of Cr<sub>2</sub>O<sub>3</sub> will be produced.

Located in Mures County in northern central Romania, Mures Magnesium SRL will construct a multi-product plant for reprocessing its 1.94 million tonnes of Chromium Ore Processing Residue (COPR). This is a low-carbon waste material feedstock source with no mining required.

Chromium (Cr) is mainly present in its hexavalent form (Cr<sup>6+</sup>), which is environmentally hazardous to both humans and the soil/water of the surrounding areas, as Cr<sup>6+</sup> is the highly mobile form of Cr. When reprocessing the COPR, Mures Magnesium

SRL removes the toxic Cr<sup>6+</sup> via an ion exchange process and recovers it for conversion to Cr<sub>2</sub>O<sub>3</sub>, the safe and stable form.

Mures County has an above-average unemployment rate in Romania. The construction and operation of this plant will create about 300 jobs in the area.

Mures Magnesium SRL will extract the Mg, Cr and Ca following a 2-phase programme. Phase 1 (year 1-9, 2026-2035) will process the COPR using an innovative multi-step hydrometallurgical process, in which magnesium will be the key product. The by-production of CaCl<sub>2</sub> for deicing roads, and Cr<sub>2</sub>O<sub>3</sub> for the steel industries makes this an exemplary waste stream valorisation process. NaOH will be a by-product of the extraction reagents. The cleaned waste will be safely stored and ecologically remediated. In Phase 2 > 2035, the front-end process will be modified and streamlined to receive micronized dolomite producing MgCl<sub>2</sub>, CaCl<sub>2</sub> and NaOH. The capacity will then be increased to 25,000 tpa in 2034.

The low-carbon technology will be upscaled by Mures Magnesium SRL via the EIT Raw Materials programme with the contribution of MEAB GmbH (Aachen, Germa-

ny) and the National Institute of Chemistry (NIC, Ljubljana, Slovenia). Molten Salt Electrolysis (MSE) will replace the hazardous "Pidgeon process", which is mainly used in China. MSE reduces the emission footprints for Mg metal production from MgCl<sub>2</sub>. This processing route is sustainable for electricity consumption and will significantly reduce the use of environmentally hazardous chemicals. EU Magnesium will set up a multi-batch proof of concept using a known technology route to demonstrate scalability via general technical aspects, allowing data for future engineering. Considering the robustness of the technology, various magnesium-containing resources will be explored for phase 2.

Currently, Europe fully depends on magnesium imported mainly from China. The cross-industry position paper of European metal-producing industries published the following on 27 September 2021: "Europe's industry associations European Aluminium, Eurofer, ACEA, EUROMETAUX, IndustriALL Europe, ECCA, ESTAL, IMA, EUWA, Euroalliages, CLEPA and Metals Packaging Europe have issued an urgent call to EU policymakers to address the imminent risk of an EU supply shortage of magnesium from China. Magnesium is "a key alloying metal and an essential raw material for aluminium alloys" (European-Aluminium.eu, 2021). Prices were skyrocketing due to severe supply constraints in Q4/2021. The European magnesium market requires approximately 145,000 tpa (2020).

Consortium: Mures Magnesium SRL (Romania), MEAB GmbH (Germany), National Institute of Chemistry of Slovenia (Slovenia), SE&C (Greece), Géosciences Conseils-Catura Geoprojects (France), Van der Laan International Consultancy B.V. (The Netherlands), EIT RawMaterials GmbH (Germany).



Source: Hebi B., pixabay.com

# Recycling or reuse – or both?

PET is known as one of the most recycled plastic materials. However, in the light of current EU legislation, reuse is becoming a more and more relevant option. In its paper “PET – from recycling champion to recycling and reuse champion: state of play 2022”, the Petcore Europe Reuse working group has analysed how PET can also play an important role when it comes to reuse.

By Michael Brunn

The paper points out that the weight of PET packaging has been reduced by 50 per cent in recent decades. The bottles are being recycled at an increasing rate. “Now, PET packaging can in some cases also play a vital role by avoiding the use of material through reuse systems,” the report points out. It wants to provide an overview regarding the potential of PET for reuse and how reuse can complement single-use packaging. “In the long-term, a smart mix of different systems and types of packaging is needed; depending on the characteristics of each market, reuse can play a more or less important role.” The report emphasizes that packaging should be used in the most circular way possible.

The report points out that reuse is a priority at EU level. There is also a shift towards reuse being more keenly observed in several EU member states. France has set out general reuse targets for packaging and specific targets for retailers to dedicate 20 per cent of their space for refilling and reuse. In Austria, reuse targets for beverages have been introduced, including targets for retailers. Spain has set out some ambitious targets as well. However, the report warns that “undifferen-

tiated reuse quotas should be looked at with caution”. Legislation should be evidence-based and non-harmonised solutions in Europe should be avoided. Another example is Germany, where the share of reusable PET bottles remains constant at around one third of all bottles used. According to the report, this shows that there is a continuous market acceptance for reusable PET bottles. However, the report also points out that a very high proportion of reusable bottles have some disadvantages. The cost of transport increases considerably and since reusable bottles are thicker, more material is also needed.

One example of a “return at drop-off point” system is the cooperative of German mineral water companies, which was established in 1996. In 2020, around two billion PET bottles were filled and the return rate is around 99 per cent. Bottles are refilled on an average of 20 times. “The GDB refillable system is a system of pool bottles. In such a system, the same standardized bottles and crates are used by different mineral water companies throughout Germany.” The report points out that this makes the system very efficient. “Importantly, although the GDB system can be hailed as a best prac-

tice, it is important to understand that some characteristics are specific to Germany and not easily replicable in other member states, such as the gross retail structure for example,” the report points out. Another example is a reusable PET bottle developed by Alpa and Kronen that provides an optimal environment for sensitive products such as juice and milk in the cold chain. As the report further points out, Coco-Cola has been running reuse models with reusable PET bottles outside of the EU for several years. For a “refill on the go” system, the report mentions a project run by the companies Henkel and Kaufland, which are setting up stations where customers can refill their bottles.

As the report further states, Deposit Refund Schemes (DRS) have proven to be an effective tool for collecting high quantities of beverage containers. The best DRS are collecting more than 90 per cent of all containers sold. The report sees a complementary role for DRS for reusable beverage bottles on markets with DRS for single-use containers and in markets with kerbside collections. However, the report sees no need to implement DRS in countries where kerbside collection is achieving good enough results.