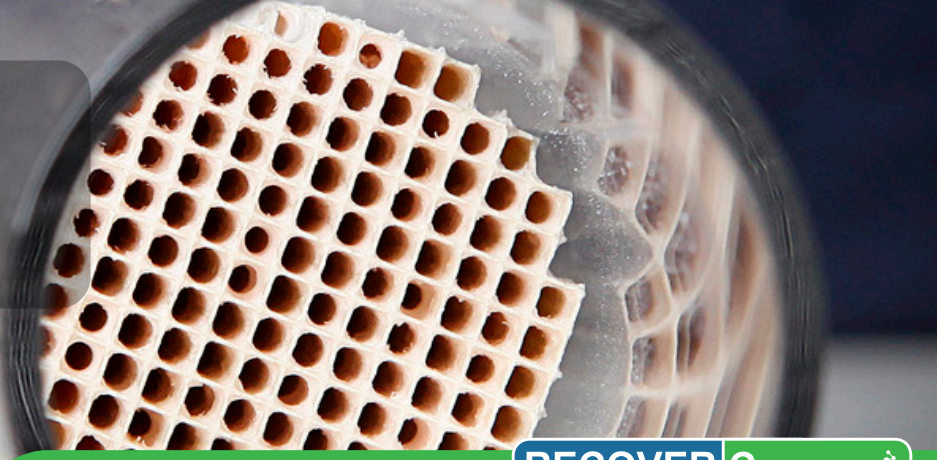
TETRONICS DATASHEET

Precious Metal Recovery from Spent Catalysts



RECOVER CATALYSTS

Recovery of precious metals from spent catalysts using Tetronics patented technology offers higher performance and a commercial advantage over alternative recovery solutions.

BENEFITS

1. Industry leading recovery rates, >98.5% typically achieved
2. Rapid precious metal returns in a closed loop system
3. Decades of experience delivering precious metal recovery systems
4. Lower capital and operating costs than competing technologies
5. Process applicable to a range of different precious metals
6. Intensive, modular process with a small footprint
7. Spent catalyst substrates are vitrified into a valuable building product - Plasmarok®

WHAT ARE SPENT CATALYSTS?

Spent catalysts, or catalyst wastes, including automotive catalytic converters and industrial catalysts (e.g. from the chemical and petrochemical industries) contain Precious Metals (PMs), specifically the Platinum Group Metals (PGMs), which are valuable due to their low natural abundance, unique properties and the complex processes that are required for their extraction and refining from primary sources.

PRECIOUS METAL RECOVERY - THE CHALLENGES

Whilst PGMs are found as naturally occurring ores, these metals may also be obtained by recycling PGM bearing material. These material streams are typically orders of magnitude richer in PGMs than their naturally occurring ore equivalents, therefore recyling these materials helps to conserve natural resources. PGMs have outstanding catalytic properties and materials suitable for recovery include: crushed autocatalyst ceramic monolith, catalytic soot filters or heterogeneous process catalyst on a variety of different substrates.

In recent years there has been a steady increase in the amount of PMs and PGMs being recovered from secondary sources, driven in large part by high commodity prices and a rapid growth in auto-catalyst recycling. The scarcity of these precious metals, alongside the increasing costs and complexities involved in their extraction from primary sources, compared with the lower costs and environmental impacts of recycling-based extraction has provided added incentives for this growing trend.

HOW TETRONICS CAN HELP

Tetronics' patented plasma systems offer considerable competitive advantage over alternative methods of obtaining precious metals, including: cupellation, hydrometallurgical leaching and thermal decomposition and/or recovery processes. Table 1 on the reverse of this sheet summarises some of the key distinguishing features of the most prevalent recovery techniques.

Tetronics' systems utilises a state-of-the-art, high temperature plasma smelting technology to recover the PGMs contained within the catalyst as a concentrated metal alloy. This alloy is subjected to further chemical refining (either in house or by third parties) before the metals re-enter the product supply chain, hence, closing the recycling loop.

RECOVER CATALYSTS

Catalyst recovery has both significant cost and environmental advantages. In addition to the recovery of PGMs, the Plasmarok® product of the process finds application as an aggregate in a wide range of traditional building applications, due to its inert, low leaching character. In the case of 'auto-cats' the metal casings are recycled using traditional routes.

Subject to material availability, the high specific values of these material streams provide a compelling justification for investment in a plasma based PM recovery plant; capital payback is typically achieved within 1–2 years at material throughputs of 1,500–2,000 tonnes per year.

TABLE 1: A summary of the key distinguishing features of the most prevalent recovery techniques

	Tetronics (Plasma)	Submerged Arc Furnace	Hydro-Metallurgical
Recovery Rates	>98.5%	92% - 96%	85% - 90%
Process	Continuous	Batch process, tipping furnaces	Bath process with considerable cycle time
Environmental Considerations	By-product is inert and can be used as aggregate	Disposal of hazardous by-product	Disposal of hazardous by-product
Other Considerations	Rapid processing time and versatile	Typically large scale, longer processing times	Applicable to limited materials

Contact Tetronics to find out how we can assist with your spent catalysts challenge.

ABOUT TETRONICS

Tetronics is a resource recovery company with more than 50 years experience globally delivering clean plasma technology for maximum resource recovery, and the highest levels of hazardous material destruction. Tetronics focuses on providing an economically stable cost base and attractive revenue streams to ensure maximised financial returns.

As a pioneer in using plasma technology for hazardous material treatment, our multi-faceted, highly qualified research and engineering team have applied the technology to an unrivalled range of hazardous material treatment challenges. Our capabilities encompass everything from initial modelling/feasibility assessment, pilot testing of the process material, through to design, supply onsite installation/commissioning and on-going support of full commercial plants.

Tetronics' track record in resource recovery, hazardous material treatment and de-carbonisation processes for a range of toxic, hazardous/industrial residues as well as resource rich streams, has resulted in more than 95 technology references across a wide and varied range of applications.

Applications include but are not limited to: recovery of Platinum Group Metals (PGMs) from Spent Catalysts, recovery of Precious Metals (PMs) from electronic waste, recovery of Base Metals from Steel Plant waste, Hazardous Material treatment (e.g. Nuclear, Air Pollution Control residues (APCr), Asbestos, Spent Potliner, Petrochemical and Organics).

Tetronics continues to work in association with many of their customers, in developing upgrade/optimisation improvements, providing specialist advice, spares and service. Our principal aim is to provide sustainable and future proof solutions to support organizations in recovering value from their waste materials while meeting their waste disposal and carbon footprint challenges.

> "We are confident that Tetronics' plasma solution provides higher levels of technical recovery than any competing technology."
>
> Chief Operating Officer
>
> SOLAR APPLIED MATERIALS TECHNOLOGY CORP.

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