

# AK98 VHR®

High Purity Reactive  
Magnesium Oxide  
for Hydrometallurgy

**AKDENİZ**  
**MİNERAL KAYNAKLARI A.Ş.**

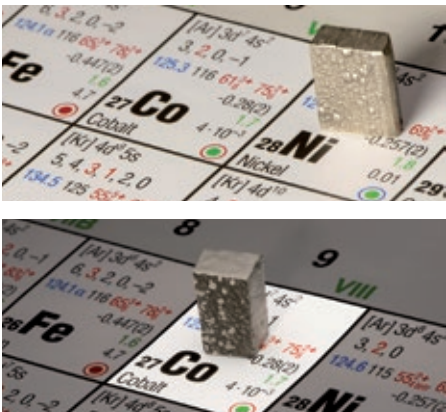
# The market

Hydrometallurgy is a technique within the field of extractive metallurgy involving the use of aqueous chemistry for the recovery of metals from ores. It involves the implementation of several production stages, the final of which involves metal recovery from leachate solutions of the ore.

## Magnesium Oxide

Selective Precipitation is one of the techniques available for the recovery of the metal or the removal of impurities.

Precipitation is typically conducted by controlling the pH of the leachate by use of alkaline reagents, such as lightly calcined (reactive) Magnesium Oxide (MgO).



General Application	Process	Stoichiometric Consumption of MgO
Nickel/Cobalt production by acid leaching of laterite ores	Mixed Hydroxide Precipitation Process (MHP): Production of Nickel Hydroxide Cake (NHC)	690 kg / mt of Ni+Co
	Mixed Sulfide Product Process (MSP): Neutralization of generated acidity (NaHS or H <sub>2</sub> S), replacing NaOH	340 kg / mt Ni (NaHS), or 690 kg / ton Ni (H <sub>2</sub> S)
Cobalt production by acid leaching of Cu-Co concentrates	Mixed Hydroxide Precipitation Process (MHP): Production of Hydroxide Cake	680 kg / mt of Co
In Situ Leaching of Uranium ores	Uranium precipitation as magnesium diuranate (MDU) yellow cake	250 kg/ mt U
	Uranium precipitation with peroxide: Neutralization of generated acidity, replacing NaOH	170 kg / mt U
Ni, Co, U production by acid leaching	pH adjustment in preliminary or secondary recovery units and wastewater streams	0.41 kg/kg H <sub>2</sub> SO <sub>4</sub>

Table 1: Use of Magnesium Oxide in several Hydrometallurgical Applications



## Advantages

Magnesium Oxide offers significant advantages over other alkaline reagents such as NaOH, Na<sub>2</sub>CO<sub>3</sub> and CaO. It is the preferred reagent for Nickel and Cobalt precipitation but can also be successfully used for Uranium precipitation and as a general neutralization reagent in the production processes of these metals.



Characteristic	Related Advantages
Better pH control	Slower reaction times Buffering action No overshoots Higher metal selectivity
Denser and more crystalline precipitates	Better filterability Low sludge volumes
Lower consumption	Less material used per unit mass of precipitated metal or acid neutralized (see table 3)
Forms highly soluble magnesium sulphate	Metal precipitate is not polluted No scaling No environmental concerns Effluent weight is lower (see table 3)
Non toxic	Easy to handle No special precautions No safety or environmental concerns

Table 2: Advantages of MgO over other reagents

Reagent vs MgO	Consumption	Weight of sulphate salt formed
NaOH	+ 100 %	+ 18 %
Na <sub>2</sub> CO <sub>3</sub>	+ 160 %	+ 18 %
CaO	+ 40 %	+ 13 %
CaCO <sub>3</sub>	+ 150 %	+ 13 %

Table 3: Comparing consumption and effluent weight of various reagents to MgO





## Our Brand

Akdeniz Mineral Kaynaklari A.S. produces and commercializes a high quality – top performance reactive Magnesium Oxide powder, under the brand name AK98 VHR, dedicated to the hydrometallurgical market.

### Chemical & physical properties – AK98 VHR:

(typical values)	AK98 VHR
MgO, ignited (%)	98,00
Citric Acid Activity (sec.)*	15
Particle Size	95% below 45 µm

*\* Reactivity can be adjusted according to customer's requirements.*

## AK98 VHR - The most cost-effective option

AK98 VHR is successfully used by several leading mining & metals companies around the world to precipitate the hydroxides of metals such as nickel (Ni), cobalt (Co) & uranium (U) from acid leachate solutions of their respective ores. AK98 VHR has demonstrated to improve both the manufacturing process and end-product quality, exhibiting better performance than other - similarly priced - natural MgO grades while matching the performance of costly, top-end, synthetic grades. This makes AK98 VHR the most cost-effective product in the market. In addition, our price stability, supply security and just-in-time delivery, are equally important factors that help our customers improve their competitiveness.

### Enhanced properties – Main advantages:

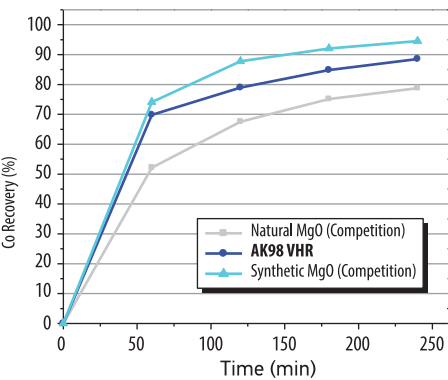
- > high metal recovery performance,
- > low MgO consumption (minimum MgO/metal ratio),
- > higher precipitated product purity / controlled precipitate concentrations of undesirable ore-originating metals

# Guaranteed Quality

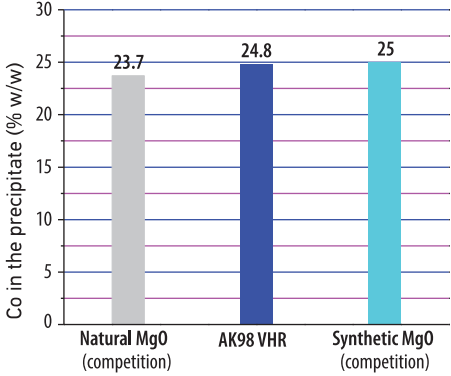
Strict quality procedures, implemented by specialized personnel, are used at all stages of the manufacturing process, from mining through the dispatch of the final products. Key properties of **AK98 VHR** are thoroughly controlled according to European and international standards and application specific or tailor-made bench scale tests developed at our corporate R&D center to ensure that they conform to customers' specifications and requirements.



## Performance Example No.1: MHP of Cobalt

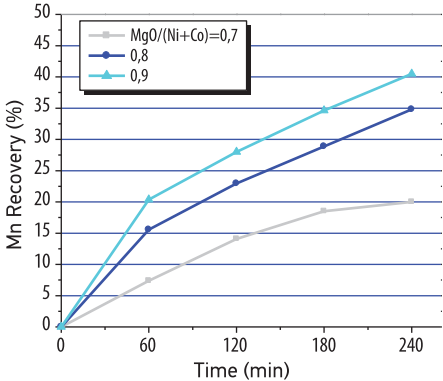
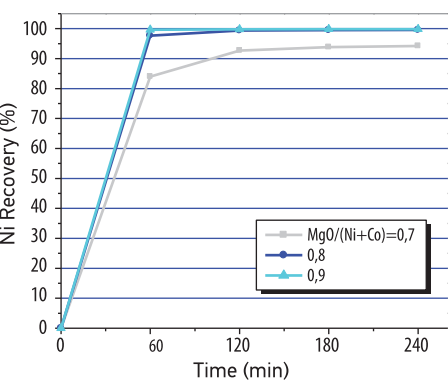


Cobalt Recovery using AK98 VHR and two benchmark MgO grades. AK98 VHR achieves higher recovery than the natural MgO and closely follows the recovery achieved with higher priced synthetic MgO.



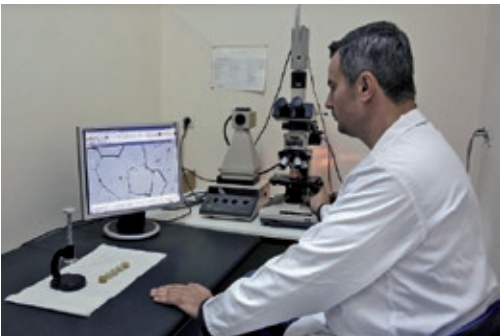
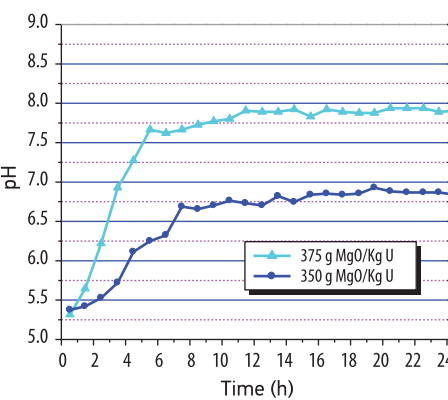
Precipitate purity using AK98 VHR and two benchmark grades. Precipitates formed with AK98 VHR exhibit higher Co concentration compared to the natural MgO and equivalent to that obtained with the synthetic MgO.

## Performance Example No. 2: MHP of Nickel



Nickel Recovery (left) and corresponding Manganese recovery (right) using AK98 VHR at various MgO/(Ni+Co) ratios. AK98 VHR exhibits high selectivity at low MgO loadings. In this example, Ni recovery after 3 hours and at only 2% above stoichiometry (i.e. MgO/(Ni+Co) = 0.7), is almost 94% while the corresponding Mn impurity recovery is less than 20%. Higher ratios can increase Ni recovery up to more than 99% but with Mn recovery reaching higher levels.

## Performance Example No. 3: Uranium Precipitation



Successfully achieving target pH during Uranium precipitation with use of AK98 VHR, at low reagent/U ratios. Corresponding ratio with NaOH is typically 600-800 g/Kg U.

## About Akdeniz Mineral Kaynaklari

Akdeniz Mineral Kaynaklari A.S. is a leading manufacturer and supplier of application-specific, high-purity, reactive calcined magnesium oxide products. Akdeniz owns and operates world-class magnesite deposits (open-cast mining) and state-of-the-art production facilities in the Eskisehir area - Kümbet, Erenkoy - in the Central-Western part of Turkey. The magnesite ore is of unique quality & purity, with low trace elements, undesirable substances and high levels of consistency.



**AKDENİZ**  
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