

► Mott nickel is safer than polymer filter media?

Semiconductor Industry – Gas Filtration Update

When it comes to gases such as oxygen, nitrogen trifluoride and fluorine, there's no room for guessing which materials are compatible. You've heard about the performance benefits of Mott all-metal filters – high strength, high efficiency and long life, to name a few. And perhaps you already know that Mott media and housings are available in several alloys, helping to ensure compatibility with virtually any process gas. But were you aware that Mott nickel filters, when certain gases are present, are intrinsically safer than their polymer counterparts? Read on to find out why.



Nickel vs. Polymer

Mott GasShield® PENTA® Filters

Nickel-based protection against hazardous risks

Higher flow, more protection

When comparing Mott PENTA filters to polymer filters, there is a clear contrast in relative strength and safety. The nickel construction of Mott PENTA filters can withstand high differential pressures that would destroy any polymer filter. And with certain process gases, the distinction grows because operator well-being can be placed at risk.



Here are gases which can have the most serious consequences when used with polymer filters:

Gas	Applications & Risks
O ₂ (Oxygen)	<p>Application – Oxygen in high-purity is used in a broad range of oxidation, plasma etching and chemical vapor deposition (CVD) processes</p> <p>Risk – Safety issues associated with component material compatibility and oxygen delivery stems. These issues recently came to light in Europe, where a number of accidents were reported involving components made with polymer or polymer parts. These parts were misapplied in oxygen gas and were related to fires which caused severe damage to gas delivery systems and put operating personnel at risk.</p> <p>(EIGA) European Industrial Gases Association (IGC Doc 13/02/E) – Filter elements are impingement locations that are considered high risk.</p>

	due to their particle-retention function. Elements are also “high surface area to volume” components which (depending on the material used) might easily ignite. Sintered nickel is recommended as filter element material.
NF₃ (Nitrogen trifluoride)	<p>Application – Nitrogen trifluoride is used as a cleaning gas for tool chambers as well as in a variety of etching applications.</p> <p>Risk – NF3 is an oxidizer and supports combustion so it is important that compatible materials of construction are chosen.</p> <p>(EIGA) European Industrial Gases Association (IGC Doc 92/03/E) – Filters made from materials which have a high auto-ignition temperature and a high thermal conductivity should be used. Sintered metal filters made from nickel are recommended.</p>
F₂ (Fluorine)	<p>Application – CVD (Chemical Vapor Deposition) Chamber Cleaning Applications.</p> <p>Risk – Fluorine is highly toxic and corrosive. The most powerful oxidizing element known and reacts violently with practically all organic and inorganic substances.</p> <p>ES&H Manual (Environment, Safety, and Health) 14.6 The Safe Handling of Fluorine – Fluorine reacts slowly with many metals at rooms temperature. However, at higher temperatures a metal more resistant to corrosion at these temperatures is required. Nickel filters can be used.</p>
CO₂ and N₂O (Carbon dioxide and nitrous oxide)	<p>Risk – These gases swell plastic filters. Metal filters are recommended.</p>

Superior filtration performance

It's a simple fact – sintered metal nickel is highly recommended for a variety of high purity gas applications within the semiconductor industry, because of its high resistance to corrosion. But that's not the only reason Mott created GasShield PENTA point-of-use filters. They also offer superior flow and low delta-p comparable to filters with polymer-based media.

Even if you're not filtering one of the gases listed above, Mott PENTA filters offer superior performance, making them the best choice for any filtration application.

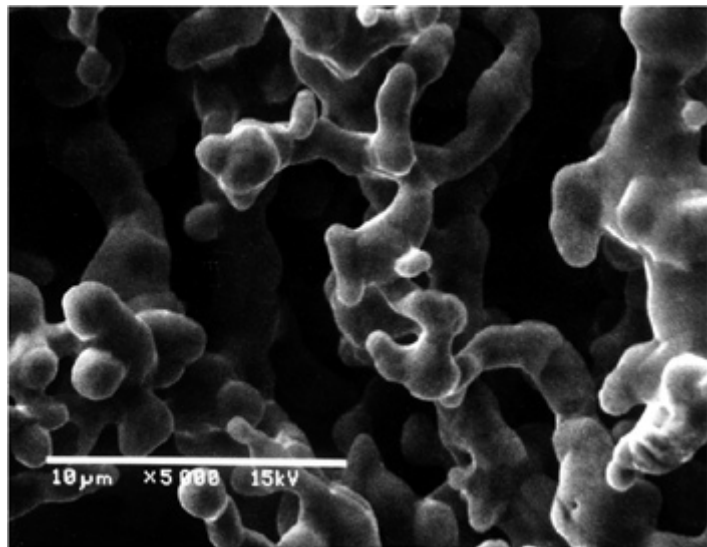
Features

- High-strength nickel filter media
- High flow rates – small footprint
- Flow rates up to 75 slpm @ 9 LRV
- Reliable performance

Specifications

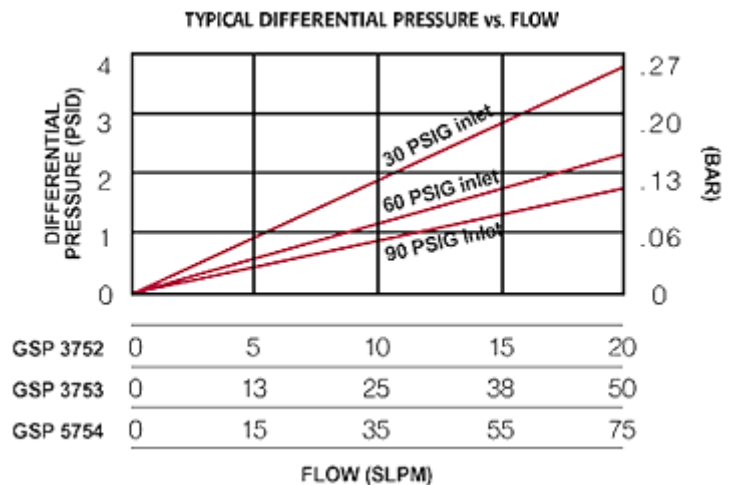
- Greater than 99.9999999% removal of all particles down to 0.003µm; confirmed at the most penetrating particle size of 0.08µm.

- Withstands temperatures to 450°C, and pressures to 3,750 psig – offering resistance to harsh conditions, and the greatest peace of mind against disaster.
- Media is sintered with no binders or slurry so "the only material of construction of the media is the media."
- All-welded construction eliminates outgassing which accompanies polymeric filters.
- Class 100 clean room manufactured and packaged. Multiple bags to ensure dryness.



High-efficiency, close up – An SEM photograph of Mott nickel media reveals the characteristics that lead to high flow and filtration efficiency – a robust structure for high differential pressures, more appendages for better particle collection, and more pore openings for low delta-p.

Typical Differential Pressure vs. Flow



About Mott High Purity

Mott Corporation was established in 1959 and became the first company to offer all-metal, high-purity filtration to semiconductor manufacturers. Mott's High Purity Division manufactures all-metal gas filters and systems in configurations ranging from 1 slpm to 200,000 slpm. Materials of construction include nickel, 316LSS and Hastelloy® which provide highly efficient filtration for processes used in the production of integrated circuits.

Mott Corporation manufactures components for the semiconductor market in state-of-the-art manufacturing facilities located in Farmington, Connecticut. The facilities provide Class 100 environments for the assembly and testing of an entire range of products produced specifically for high purity applications. Mott has full CNC capability for hardware manufacture as well as state-of-the-art automated test equipment for 100% integrity testing of all components. Welding operations are computer controlled ensuring repeatable precision welds. Visitors are always welcome for tours of our facilities. Contact us at quest@mottcorp.com to schedule a visit.



PENTA filter elements constructed of 100% high flow nickel media contain less surface area, which minimizes levels of moisture and hydrocarbons while maximizing flow.

For more information

Click on the images below to download our [8-page GasShield_PENTA filter brochure](#). You may also contact us at High Purity Sales, Mott Corporation, 84 Spring Lane, Farmington, CT 06032, 1-860-747-6333 or Toll-Free 1-800-BUY-MOTT. E-mail: quest@mottcorp.com.

