



TECH NOTE

Sodium Permanganate vs. Potassium Permanganate New and Improved “Purple Pellet” Provides Higher Working Capacity

Beginning with the original Purafil media and all the way through the current Purafil Select media, potassium permanganate (KMnO_4) is what gave the media its characteristic purple color as well as a vastly improved performance versus other types of dry-scrubbing air filtration media. Purafil media was introduced with a 4% KMnO_4 content and as Purafil perfected and improved its proprietary media manufacturing process, this was increased to 8% several years ago. As expected, this doubling of the active oxidant content resulted in a doubling of the removal capacity for the Purafil Select media. With an increased removal capacity, Purafil Select offered a longer service life and the potential to reduce the size of Purafil's air filtration systems. Knowing that increasing the available active oxidant content beyond 8% would provide even better performance, development began on a new “purple pellet.”

The KMnO_4 used by Purafil is a strong inorganic oxidizing agent that is supplied as dark purple crystals or granules. Purafil's manufacturing process requires that the KMnO_4 be used in liquid form, however, it has a low solubility in water (8.6 oz/gal, 65.0 g/L) and there are inherent difficulties in handling and processing this material. Historically, the impregnation level in the media had essentially been determined by the amount of KMnO_4 that could be added to the media and kept fully available for reaction. This describes the current 8% active oxidant content of the Purafil Select media. When using KMnO_4 as the active oxidant, trying to raise the impregnation level to 10%, 12%, or higher actually results in reduced media performance. Because of its low solubility in water, the KMnO_4 would recrystallize and fill up the adsorption sites - significantly decreasing the surface area, pore volume, and the availability of the KMnO_4 in the media.

Even as Purafil Select media was being introduced almost ten years ago, development had already begun on the next generation of active oxidant media. Knowing that the maximum *effective* KMnO_4 content had been reached with Purafil Select, any new media developed had to maintain the broad spectrum oxidizing power of KMnO_4 while at the same time providing better overall performance. With more than 30 years of experience with and knowledge of oxidation chemistry, and specifically permanganate chemistry, we knew that there were other options available to us. This is what led us to sodium permanganate.

Sodium permanganate (NaMnO_4) is an inorganic oxidant that performs chemically the same way as potassium permanganate, only in a more concentrated form. Purafil had been working with sodium permanganate even before the introduction of Purafil Select, but its limited availability delayed the start of a comprehensive new product development program. However, we continued our research into NaMnO_4 chemistry and its potential applications which provided a much better understanding of pore size geometry and by-product formation and their relation to overall media performance.

Using this knowledge and after completing an extensive 4-year research and development effort, Purafil has now developed the industry's first dry-scrubbing air filtration media with an active oxidant content of 12% by weight - **Purafil SP**, the new purple pellet. Purafil SP provides a full 50% increase in the amount of *effective* active oxidant content on the media, which in turn provides a greater working capacity for installed systems. Another significant advantage in using NaMnO_4 is its high solubility in water, which allows the use of a more concentrated form of permanganate in the media manufacturing process and eliminates concerns about recrystallizing as with the KMnO_4 at high impregnation levels.

The Purafil SP media is somewhat alkaline in nature allowing the additional permanganate content to readily oxidize reactive/volatile sulfides (H_2S) to sulfate salts. Mercaptans and other reduced sulfur compounds are also oxidized by sodium permanganate. Lower molecular weight organic compounds such as aldehydes, ketones, ethers, alcohols and organic acids can be reacted to form nontoxic organic salts, carbon dioxide and water. Ethylene, arsine, phosphine, hydrazines, and many other chemical compounds can be controlled with Purafil SP.

Purafil SP is just the latest step in Purafil, Inc.'s dry-scrubbing media development efforts. Having a product that provides a full 50% increase in the amount of available active oxidant will provide a significant increase in a filtration system's working capacity, increased performance against a wide range of gaseous contaminants, and an improved cost-of-ownership for the end-user.