

REAXIS® C1001, Stannous Pyrophosphate

REAXIS® C1001, stannous pyrophosphate ($\text{Sn}_2\text{P}_2\text{O}_7$), is a high density free-flowing fine white powder with high stannous (Sn^{2+}) content. It is a member of the inorganic tin family and is currently being utilized in applications ranging from oral care¹, as a dentifrice polishing agent, to lithium-ion batteries as a negative electrode^{2,3}. Additionally, stannous pyrophosphate can be utilized in electrodeposition and electroplating applications^{4,5}, water treatment⁶, and medical imaging⁷.

Pure stannous pyrophosphate is a 2:1 complex, (Sn^{2+}):(P_2O_7), with a stannous content of 57.7%. Structurally each tetravalent pyrophosphate anion chelates two stannous cations, which produces two 6-member rings (FIG 1A). These unit cells create a networked solid through additional coordination with neighboring pyrophosphate molecules yielding stable three coordinate tin atoms (FIG 1B)⁸.

mineral acids⁹. $\text{Sn}_2\text{P}_2\text{O}_7$ does not melt but instead undergoes thermal decomposition at 400 °C.

Reaxis manufactures high purity stannous pyrophosphate with low levels of residual metal content and near-theoretical tin content as seen in Table 1. The FT-IR overlay of a 98% pure stannous pyrophosphate standard and REAXIS® C1001 also illustrates the product quality (FIG 2).

TABLE 1. Specifications for REAXIS® C1001

Sn²⁺ content (%)	55.5 – 57.5
Sn^T (%)	55.5 – 58.0
Sn²⁺/Sn^T (%)	95.7 – 100
Fe content (ppm)	≤ 50
Pb content (ppm)	≤ 50
Sb content (ppm)	≤ 50
Moisture content (%)	≤ 0.50

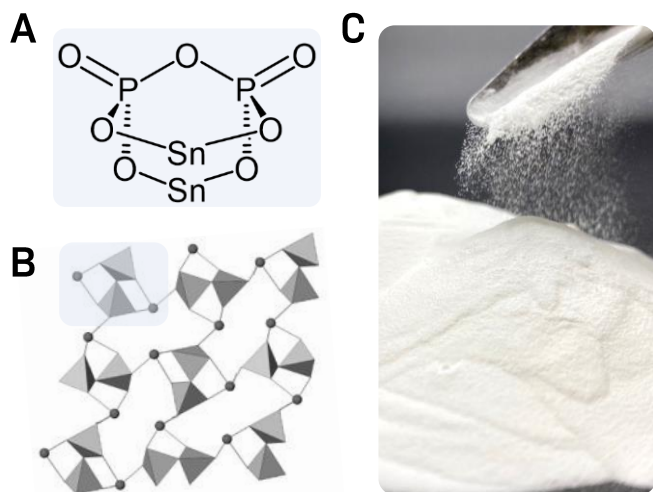


Figure 1. (A) Structure of stannous pyrophosphate. (B) Crystallographic projection of the $\text{Sn}_2\text{P}_2\text{O}_7$ crystal structure. Adapted with permission from Chernaya *et al*, *Chemistry of Materials* **2005** 17(2), 284-290. Copyright (2021) American Chemical Society. Spheres represent individual Sn^{2+} atoms and pyramids represent P_2O_7 with each vertex being an oxygen. (C) Physical appearance of REAXIS® C1001.

REAXIS® C1001 is traditionally utilized in processes as a fine white powder with a solid density of ~4.0 g/mL (FIG 1C) or as a slurry in deionized water. The solid, however, is insoluble in water. Aqueous solutions can be obtained by adding excess sodium or potassium pyrophosphate solutions until the molar ratio of (Sn^{2+}):(P_2O_7) is $\geq 1:1$, yielding either $\text{K}_2\text{SnP}_2\text{O}_7$ or $\text{Na}_2\text{SnP}_2\text{O}_7$, or by dissolving in

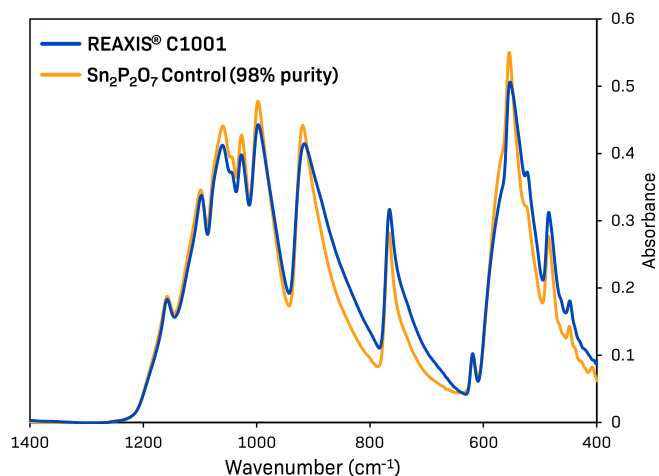


Figure 2. Fourier-transform infrared spectroscopy spectra overlay of stannous pyrophosphate (98% purity) and REAXIS® C1001 in the wavenumber region of 1400 – 400 cm^{-1} .

REAXIS offers additional solid inorganic stannous tin products, which include stannous chloride dihydrate (C154) and blends thereof (C154S, C154S+, C154T, C154P), stannous oxalate (C160), anhydrous stannous chloride (C162), and stannous oxide (C188). Customized product design and sampling is available upon request.

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