

# Sporopollenin Microparticles

## Description

The name sporopollenin was coined by Zetzsche<sup>1</sup> to describe the material which forms the outer highly resistant coat (exine) of pollen grains and related microspores. The resistance of the material to both chemical and biological decay has resulted in the survival in sedimentary rocks of individual pollen grains for at least 500 millions years and of microspores in Precambrian rocks dates up to about  $3.5 \times 10^9$  years.<sup>2-7</sup> The exine has been called "one of the most extraordinary resistant materials in the organic world".<sup>8</sup>

Sporopollenin is separated from the microspore by successive treatment with solvents, caustic, and acid to remove the inner (intine) cellulose wall and then finally treated to produce a ninhydrin negative product. At the end of these treatments, the outer spore coats are preserved morphologically. The chemical structure of sporopollenin is uncertain, but evidence suggests that it is an oxidative polymer of carotenoids and carotenoid esters.<sup>5</sup> The particle size of lycopodium sporopollenin is about 28 $\mu$ m. Sporopollenin or functionalized sporopollenins are yellow-brown free-flowing solids.

## Procedure

Researchers are advised to optimize the use of particles in any application.

### Solid Phase Peptide Synthesis

A suitably functionalized sporopollenin has shown promise as a medium for solid phase peptide synthesis.<sup>9</sup> An appropriate functional group (CH<sub>2</sub>Cl) may be introduced by chloromethylation, and peptides can then be built up on the support by a standard Merrifield reaction sequence.

Sporopollenin may also be functionalized with a primary aliphatic or aromatic amino group by reaction with aliphatic or aromatic diamines such as 1,3-diamino-propane. The aminosporopollenin may be used to synthesize peptides by prior reaction with chloroacetic anhydride followed by p-hydroxybenzyl alcohol.

The benzyl group may be acylated with BOC- or Fmoc-amino acids and peptide chains elaborated in the normal manner. Many variations are clearly possible. Some advantages of sporopollenin as a solid phase support include:

1. The support is chemically, physically, and biologically stable to repeated chemical treatments used in peptide column procedures.
2. The support does not produce fines and allows the ready flow of solvents, thus making for more efficient washing procedures.
3. The support has a non-variant homogeneous and macroporous surface structure with many binding sites and is guaranteed to produce the same results on every occasion and batch to batch. Synthetic resins suffer from batch variability.
4. The homogenous nature of the support is such as to encourage belief that synchronous synthesis of peptides is more likely to occur than is the case with the inevitably variable synthetic resin supports.

### Ion Exchange, Chromatography and Catalyst Application

The basic functionalized sporopollenins are of potential value as ion-exchange materials and as chromatographic media. The absence of "fines" allows especially smooth and regular solvent flow. The material may also be used as a highly insoluble catalyst support. Numerous functional groups may be attached for affinity chromatography.

### Other Applications

The sporopollenin derivatives offer an alternative material for attachment of either enzymes or enzyme substrates and antibodies. The spore structure and high surface area of support would be of special value here.

## References

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3. **Brooks, J., G. Shaw.** 1968. *Nature*, 219:532-553.
4. **Shaw, G.** 1970. In: Harborne, J., Ed. *Phytochemical Phylogeny*. London and New York: Academic Press, pp. 31-58.
5. **Shaw, G.** 1971. In: Shaw, G., et al., Ed. *Sporopollenin*. London and New York: Academic Press, pp. 305-350.
6. **Shaw, G.** In: Heslop-Harrison, J., Ed. *Pollen Development and Physiology*. London: Butterworths, pp. 99-114.
7. **Brooks, J., M.D. Muir, G. Shaw.** 1973. *Nature*, 224:215-217.
8. **Faegri, I., J. Iversen.** 1984. In: *Textbook of Pollen Analysis*. Oxford: Blackwell.
9. **Mackenzie, G., G. Shaw.** *Int J Peptide Protein Res*, 15:298-300.

## Storage and Stability

This material has an indefinite shelf life and does not require refrigeration for protection from microorganisms. It should not be exposed overly to strong oxidizing agents.

## Safety

The full chemical, physical, and toxicological properties of these chemicals are not known. Avoid any contact with skin, eyes, or respiratory system.

**This product is for research use only and is not intended for use in humans or for *in vitro* diagnostic use.**

## Ordering Information

Cat. Number	Description	Size
16867-1	Sporopollenin Lycopodium	1g

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