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**FLEXITALLIC
THERMICULITE™
866**

PRELIMINARY DATASHEET

PRODUCT REFERENCE: FLEXITALLIC THERMICULITE™ 866

PRODUCT DESCRIPTION:

Thermiculite 866 is a high temperature sealing material giving good service in a solid oxide fuel cell application. It is based upon the mineral vermiculite and contains no organic binder or any other organic component.

Vermiculite is a natural sheet silicate mineral formed by hydro-thermal modification of biotite and phlogopite mica, it retains all the thermal and chemical durability of mica and remains electrically insulating. Like mica, vermiculite occurs as plate morphology particles, "books", consisting of thousands of individual platelets, each nanometres thick, positioned one on top of the next. These particles can be opened up, "exfoliated", like the pages of a book to reveal the individual platelets.

The traditional method of exfoliation is thermal and in this thermally exfoliated form vermiculite is well known as a thermal insulation, a packaging material and in many other applications. Another method of exfoliation is chemical exfoliation. This produces a dispersion of individual platelets which are separated from each other. These platelets are highly flexible and conform to the surfaces of other particles to bind them together.

This binding action allows a sheet material to be manufactured without any organic binding agents being present, thus Thermiculite 866 consists just of the chemically exfoliated vermiculite and a second filler material. The second filler material is a very familiar mineral, talc, also known as steatite and soapstone. Like mica and vermiculite, steatite is also a naturally occurring, high temperature stable, sheet silicate mineral but it is characterized in that it is very soft.

The combination of the chemically exfoliated vermiculite with steatite results in a material that retains all the chemical and thermal durability of mica but which is very soft and conformable. The manufacturing method used to produce the 866 foil results in the vermiculite and steatite plates and platelets being aligned parallel to each other and parallel to the plane of the foil.

The softness of the material and the plate alignment result in a material which compresses under very low load to produce a compacted material that offers a very tortuous path to any gas trying to permeate through it in the plane of the sheet or perpendicular to that plane. This means that the material has superb low stress sealing characteristics combined with peerless thermal stability. This makes it admirable for SOFC sealing applications.

A gasket must first create a seal and must then maintain that seal for the required lifetime. Thermiculite 866 is excellent in both of these respects.

It is soft and highly conformable and therefore creation of both macro and micro sealing is readily achieved. Also, maintaining the seal is not a problem as it contains no organic components that would result in relaxation or creep and, in a connection stressed by bolts, lead to loss of surface load on the gasket.

Density:

Thermiculite 866 "as made" for all thicknesses Density 1.3 gm / cm³

Thermiculite 866 "consolidated"

Consolidated from 1.0 mm to 0.7 mm or from 0.7 mm to 0.5 mm Density 1.8 gm / cm³

PDS 436 03/08

This Data Sheet refers to the material as supplied. The information contained herein is given in good faith, but no liability will be accepted by the Company in relation to same. We reserve the right to change the details given on this Data Sheet as additional information is acquired. Customers requiring the latest version of this Data Sheet should contact our Applications Engineering Department. The information given and, in particular, any parameters, should be used for guidance purposes only. The Company does not give any warranty that the product will be suitable for the use intended by the customer.

Please contact Flexitallic Applications Engineering Department for further information.

Best Sealing Practice

To obtain the best performance from a sealing material the following considerations apply just as much to an SOFC as to an industrial pipeline gasket:-

Minimize the gasket area as far as possible taking into consideration gasket handling

Maximize the compressive load available

Use studs of the appropriate metal and stress to a high percentage of yield

Minimize load loss by making the studs as compliant as possible by using the minimum stud diameter suitable and by using extension collars or constant load washers such as Belville washers

Tighten the studs in a cross pattern manner

Tighten the studs using either controlled torque or hydraulic tensioners

With torque tensioning use a reliable lubricant having a known friction factor

Unless the gasket is compensating for connection defects, always use the minimum practical thickness

The surfaces to be sealed should be free from transverse machining marks or scratches and be of an appropriate surface finish

Correctly used, an appropriate gasket may be able to provide a seal whilst avoiding the implied cost of a more robust design or components of tighter tolerances.

HEALTH AND SAFETY

Because of the processes which take place during manufacture, the product is believed to present no health and safety hazard and, under normal handling and use it is unlikely that the product will give rise to significant levels of exposure to constituent materials.

Flexitallic Thermiculite 866 comprises chemically exfoliated vermiculite and steatite.

Under harsh mechanical treatment (e.g. high speed stamping operations or abrasion) the constituents may give rise to irritant dust which, in extreme cases of exposure, could lead to more serious respiratory problems. Occupational exposure to such dusts should therefore be minimised and kept below relevant national exposure limits. Good standards of hygiene should be applied during gasket cutting operations and off-cuts should be disposed of by transfer to a site appropriately licensed to accept industrial materials of this nature.

Thermiculite 866 is not combustible.

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