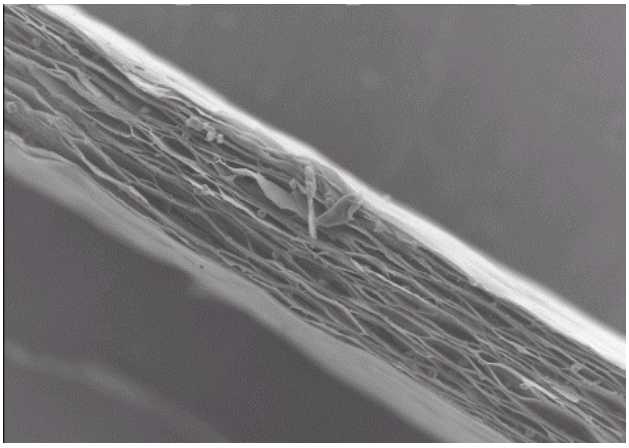
INTRODUCTION

The core competence of the Emfit sensor products is the innovative, patented Emfit film, which has an unique, strong electromechanical response. The film is based on a polyolefin material manufactured in a continuous biaxial orientation process that stretches the film in two perpendicular directions (machine direction and the transverse direction). The structure of Emfit film consists of flat voids separated by thin polyolefin layers. Typically Emfit film is about 65-70 µm thick. The voids are made by compounding small particles, which functions as rupture nuclei and form closed lens-like cavities to the film during the biaxial orientation.

The bi-axially oriented film is further swelled with patented high-pressure gas injection technology. The swelling process more than doubles the thickness and elasticity of the film by increasing the size of air-voids inside it. Electromechanical response with properly swelled cellular film is over 10-fold compared to the situation where the film is charged before swelling.

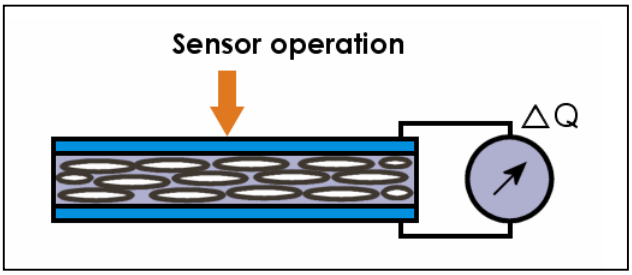


SEM picture of swelled Emfit film.

USES

Emfit film sheets are useable for both research and production.

SENSOR OPERATION



Operating in a reciprocal fashion, changes in the thickness of the Emfit sensor generate a corresponding charge and hence, voltage to appear on the electrodes. The transducer behaves like an “active” capacitor, consequently, the loading of the signal by the input impedance of the measuring device must be considered.

Due to the thinness of the films, the associated capacitance can be sufficient to give adequate low frequency response to a standard 1 MΩ load but the use of an X10 probe will extend the low frequency range by a decade. For extremely low force change levels, some buffering may be desirable. For the majority of analysis work, this is unnecessary and the film can feed directly to the instrument. Again, the low mass contributed by the transducer is of major importance, as well as its non-resonate behaviour. Frequency response is inherently flat to over 20 KHz with only the R-C roll off at low frequencies distorting the profile.

Though it responds to thickness change rather than strain, low signal levels may be generated by low frequency flexing, so a distinction must be made between the frequency response of the film for changes in its primary parameter (i.e. thickness) and its relative behaviour compared with, say piezoelectric sensors. The sensor has a flat response over a very wide frequency range, with resonant frequency points well above 20 KHz.

OTHER SPECIFICATIONS

Property	Symbol	Value	Unit	Tolerance	Conditions
Storage temperature	Ts	from -40 to +50	°C		
Operating temperature[1]	Tr	from -20 to +50	°C		
Thickness	D	70	µm	±5 %	
Sensitivity[2]	Sq	25-250	pC/N	±20 %	normal force
Youngs modulus, TD		0,5	Mpa	±50 %	
Operating force range	P	N/cm2	>100		

1) Loss of sensitivity is < 20 % after the following temperature cycles:
   a) 11 hours at –20 °C, 1 hour at +20 °C, 11 hours at +70 °C, 1 hour at +20 °C, 28 cycles;
   b) 1 hour at –20 °C, 1 hour at +70 °C, 10 cycles.
2) Sensitivity depends on the pre-aging. Max sensitivity available is up to about 250 pC/N.

ADDITIONAL INFORMATION

For additional information or assistance, please contact:

Emfit Ltd
Sensor Products Division
Konttisentie 8
FI-40800 Vaajakoski, FINLAND
Tel: +358-14-332-9000
Fax: +358-14-332-9001
Email: info@emfit.com
Website: www.emfit.com