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Procedure for the Fixing and Encapsulation of Asbestos Fibres on Weathered Asbestos Cement by Dakfill

Introduction

Old asbestos cement, and according to certain studies, new asbestos cement as well, have the bad property of burdening nature with asbestos fibres.

A possible solution to this problem is the application of a sufficiently durable coating that can resist an aggressive environment.

Purpose

The purpose of this study is to examine the effectiveness of a coating system of the Dakfill type with an organic solvent-based primer.

Description of the Coating System

Dakfill

Semi-liquid waterproofing product based on acrylic resins dispersed in water.
Solids content: 73 - 74 %
Specific weight: 1.510

Primer-44

Pigmented priming coat based on plastified chlorinated rubber.
Solids content: 54 - 55 %
Specific weight: 1.130
Viscosity: 75" Din cup No. 4

Primer-44 is diluted with 30 % Thinner-22 and applied to saturate the substrate. After 48 hours of drying, two more coats of Dakfill of 650 gr/m2 are applied.

Experimental Part

A. Aging and Resistance of the Coating

Three types of weathering and aggression have been provided: the QUV test, the Kesternich test and an immersion test in an acid solution. Beside the coating applied, a part of the surface of the test panels is left naked in order to be able to follow the evolution of the asbestos cement during the aging process.

A.1. QUV test:
five panels are subjected to the following cycle for 43 days
- 4 hours of irradiation by a B 313 UV lamp at 60° next
- 4 hours of condensation at 100 % relative humidity and 40°C.

The test is done in conformity with the ASTM G53 standard.

A.2. Kesternich test:
four other panels are subjected for 25 days to a cycle of 8 hours of SO_2 injection in the atmosphere followed by 16 hours of rest, this according to DIN 50017 SK.

A.3. Immersion test:
a third series of four plates is immersed for 46 days in demineralized water brought to pH 3.5 by means of an acid mixture consisting of 25 ml of H_2SO_4 and 11 ml of HNO_3.

After drying, one panel is chosen for every aggression test. A test piece of that panel is then taken from the protection system and from the naked asbestos cement to examine it further in the electron microscope.

B. Environment Protecting Effect of the Coating

The protection effect of the Dakfill system will be studied, and it will be examined to which extent the coating system can offer protection by preventing the asbestos fibres from entering the environment.

When preparing the test, we were inspired by an article entitled "Zur Emission von Asbestfasern aus Asbestzementplatten" from "Sonderdruck aus Staub-Reinhaltung der Luft 39(1979) No. 11, S.422/427.

One of the ways in which asbestos fibres can enter the environment is by washing out caused by precipitation.

The test to simulate this is done as follows. An asbestos cement slab to which the coating system has been applied as described above is put up under an angle of 45°. A litre of demineralized water is brought to pH5 by a mixture of 25 ml of H_2SO_4 and 11 ml of HNO_3. This solution simulating acid rain runs by drops over 5 to 6 cm of the put up slab for about 24 hours. The liquid that has run down is caught on a diaphragm filter with a 50 mm diameter and 0.1 µm pores size.

The test is done on the coating system and the naked panel. A piece of the diaphragm filter is examined on the presence of asbestos fibres by means of a frame electron microscope.

Comments on the Results

The photographs of which a list is attached bear a 4-digit number at the bottom left hand of which the code used appears in the table below.

TABLE 1: Explanatory code of the photographs

	Coating	Naked	
		Before the test	After the test
QUV	0010	0050	0040
Kesternich	0100	0500	0400
Immersion	1000	5000	4000

A. Aging

The comparison of the initial samples of the asbestos cement (thus before they were subjected to the aggression test - photographs 0500.5000) shows a certain heterogenity. So, for some samples there are more and for other there are less fibres at the surface, but the proceeding corrosion does not change the outer aspect of the naked asbestos cement much.
As regards the coating system, we have no remarks in respect of the visual judgment of the test panel. Neither was any corrosion found in the course of the further electron microscopic examination of the coating surfaces. The examination of the section of a coating applied to asbestos cement shows (photograph 1101) the close contact between the paint and its carrier of which all asbestos fibres are embedded or fixed.

B. Environment Protecting Character

When the examination was scaled up by x10,000, no carried away fibres were found on the filter as to the coating system.

On the other hand, in the case of the naked panel, asbestos fibres were found on the filter. Photographs 0401, 0402, 0403, 0404, 0405 and 0406 give an idea of some fields. 200 fields of 108 μm^2 each have thus been examined and 88 pieces of asbestos fibres have been found. When extrapolating from these data to the total filter surface, which is 19.62 m^2 in area, it can be put that 8.10^6 pieces of fibre have been carried away.

This number will largely depend on the condition of the asbestos cement slab.

After a 1000-hour condensation test during which the test panels were kept in an atmosphere of water vapour condensation, another washing out test was done in the same circumstances as those described above.

As to the naked asbestos cement, $7.5.10^6$ carried away pieces of asbestos fibre were counted. On the other hand, no such pieces were counted as to the intact coating system.

So, old asbestos cement keeps giving off free fibres to its environment if they are not fixed.

Conclusion

The Dakfill system can be applied to aged asbestos cement. It stands the aging tests successfully.

From the point of view of the pollution of the environment by asbestos fibres, the Dakfill system offers an efficient solution by preventing such fibres from spreading in nature.

Limelette, May 17, 1990

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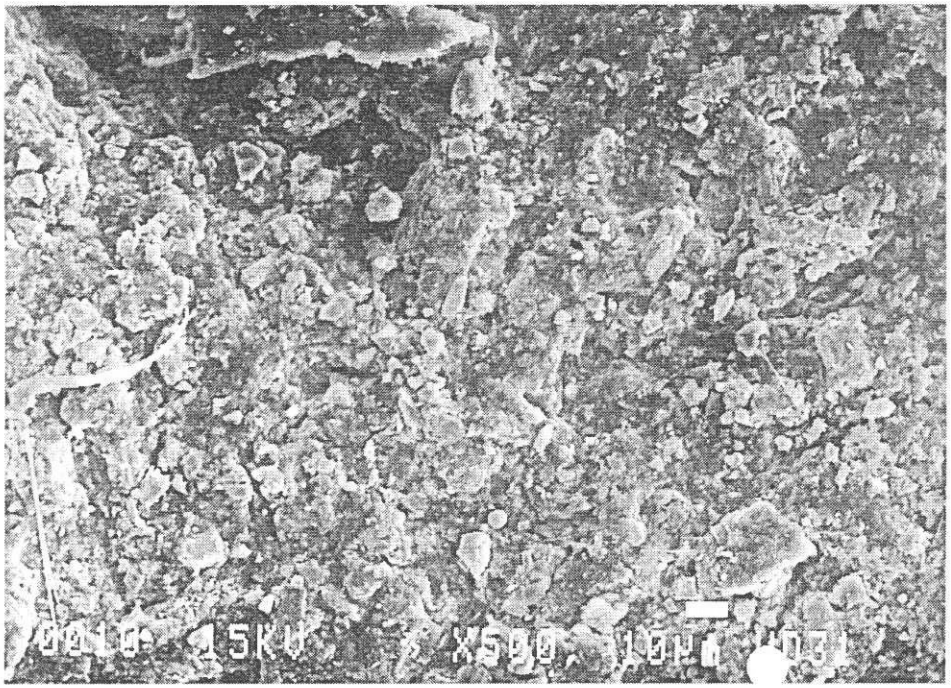
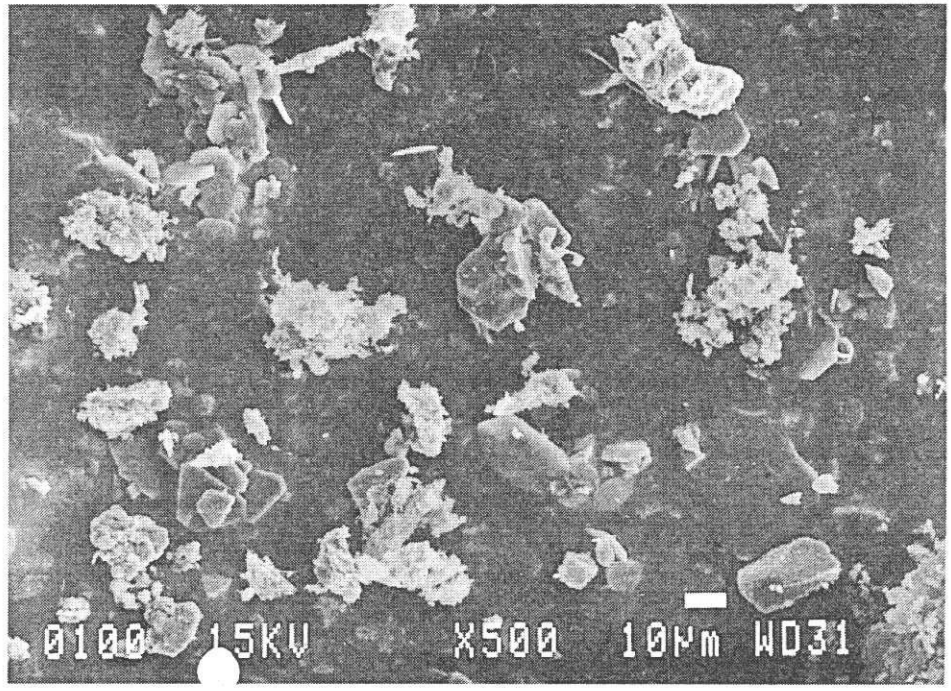
Annex

List of Photographs

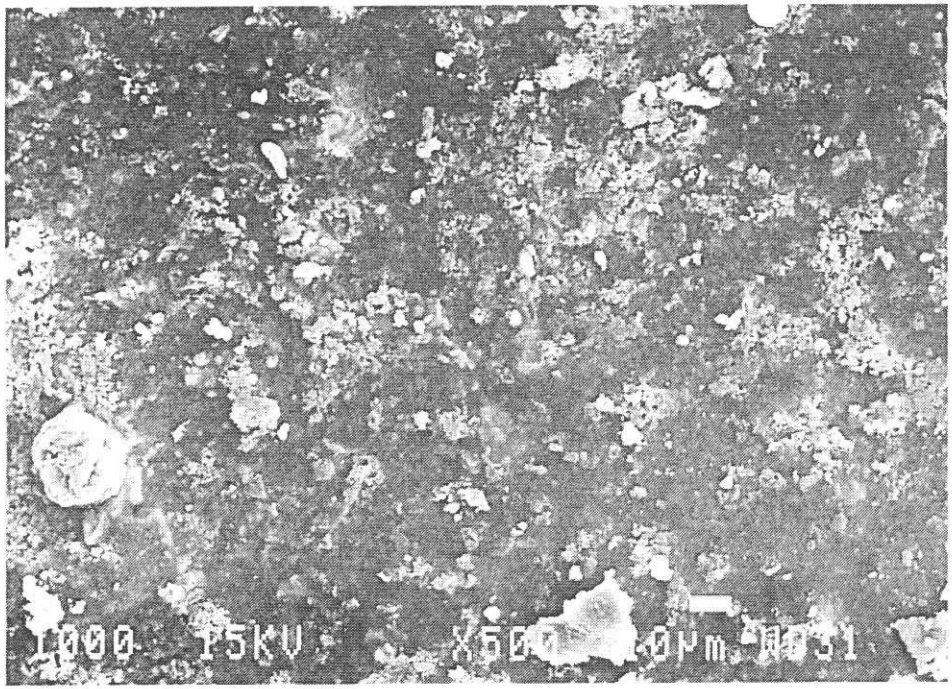
0010 paint system 1 after QUV
0100 paint system 1 after Kesternich
1000 paint system 1 after immersion in acid bath
0500 naked asbestos cement before Kesternich
5000 naked asbestos cement before immersion in acid bath
0400 naked asbestos cement after Kesternich
4000 naked asbestos cement after immersion in acid bath
1101 cross-section paint system 1
0401 asbestos fibre on diaphragm filter
0402 asbestos fibre on diaphragm filter
0403 asbestos fibre on diaphragm filter
0404 asbestos fibre on diaphragm filter
0405 asbestos fibre on diaphragm filter
0406 asbestos fibre on diaphragm filter



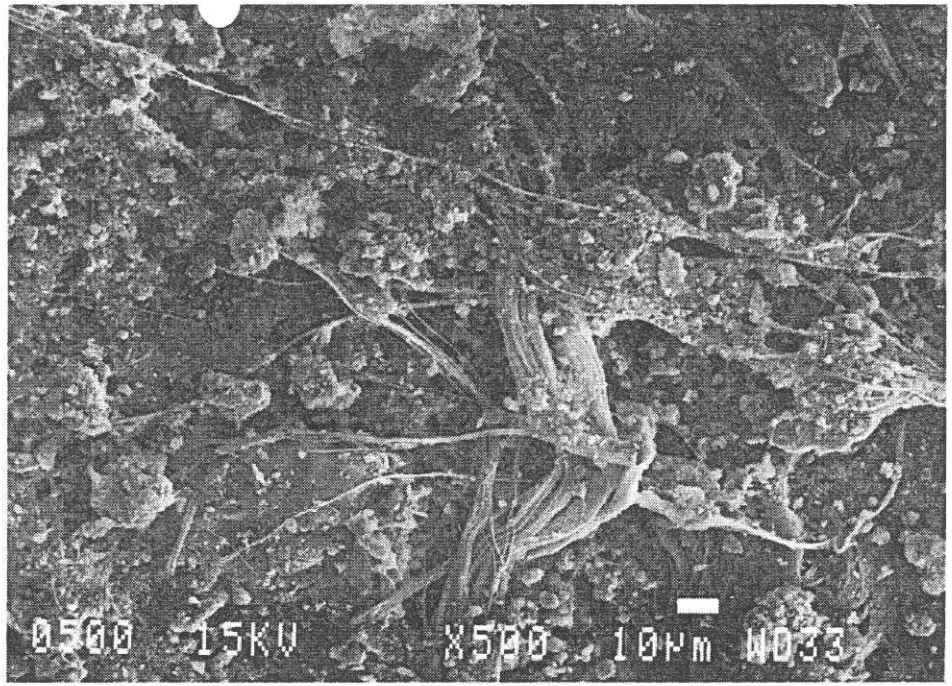
◀ 0010



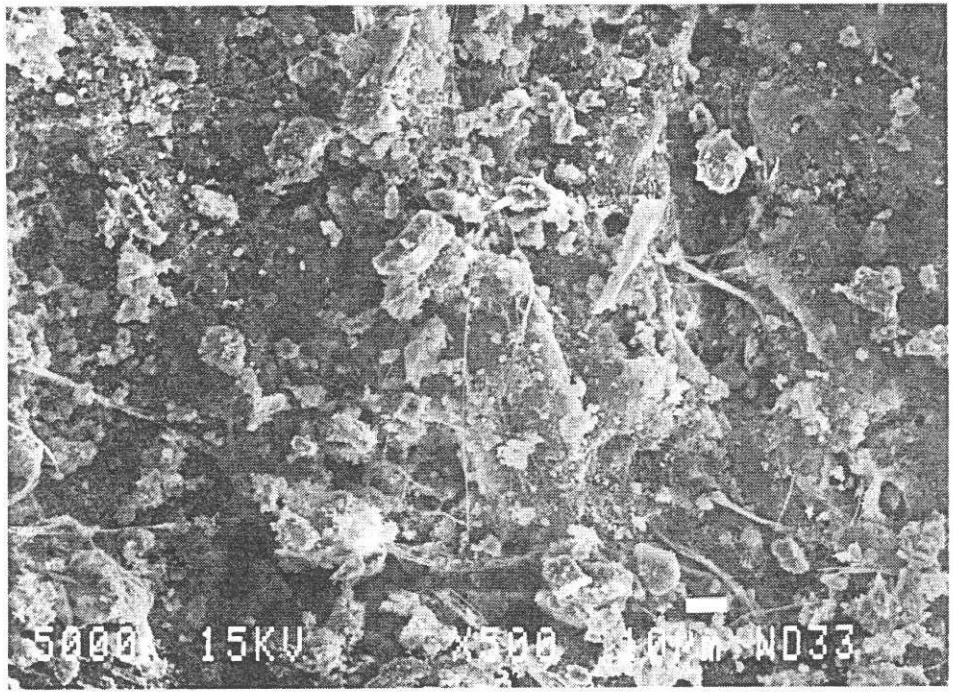
0100 ▶



◀ 1000



0500 ▶



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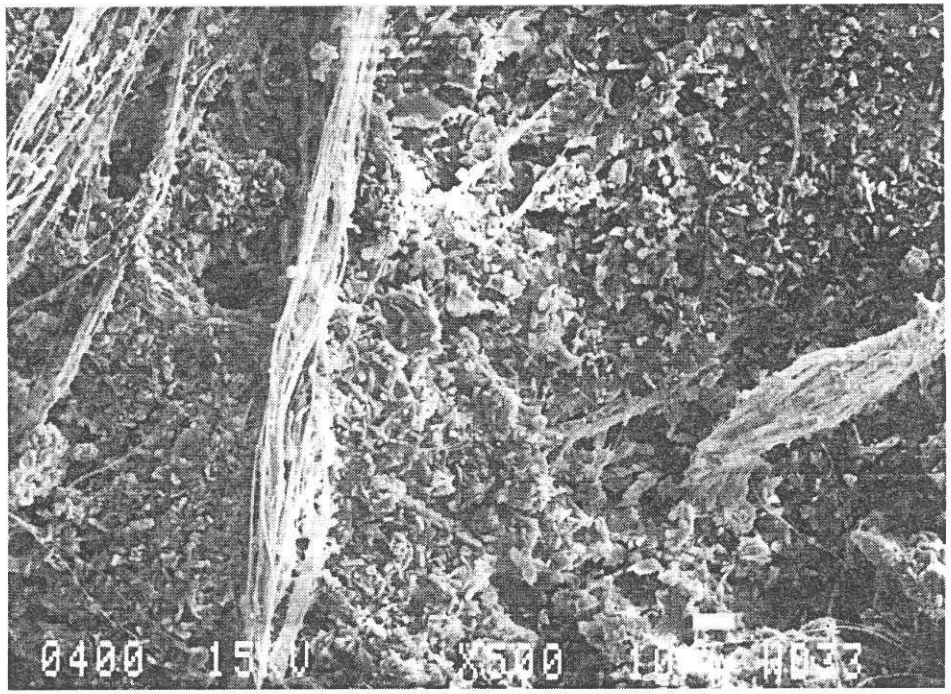
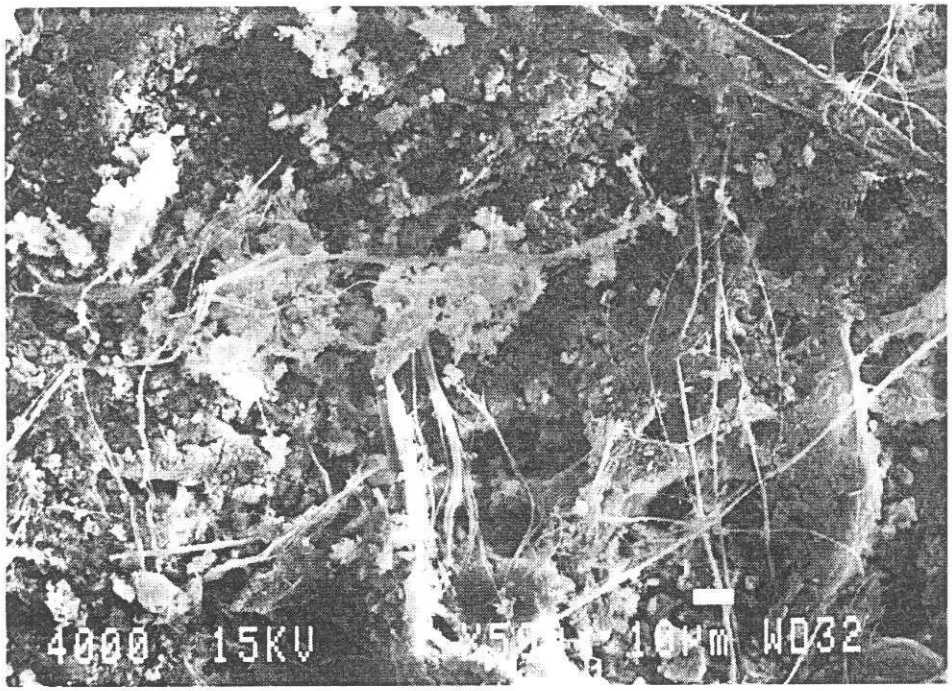


0400 ▶



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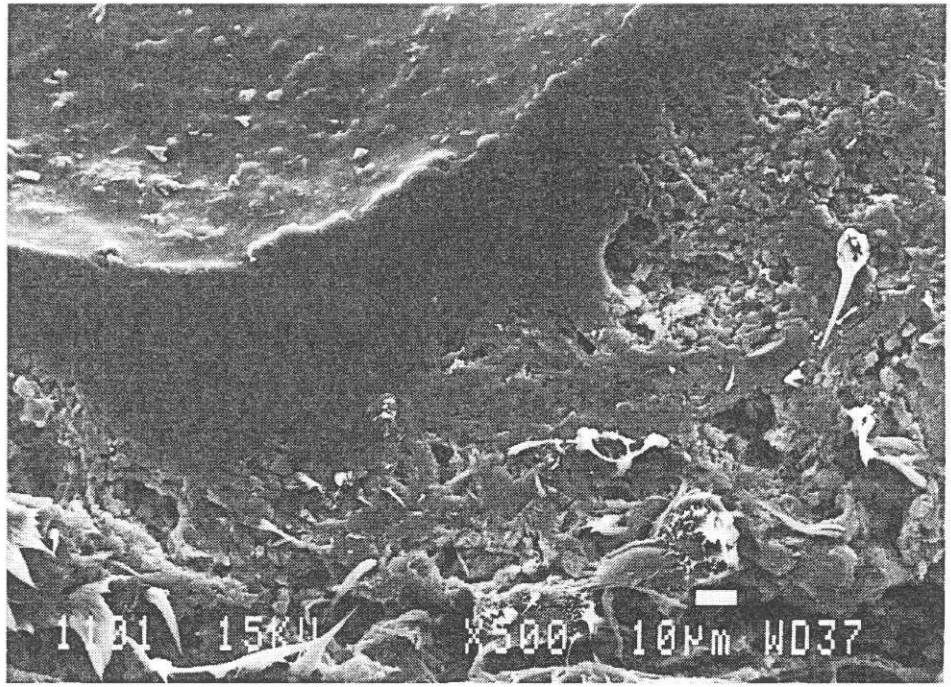
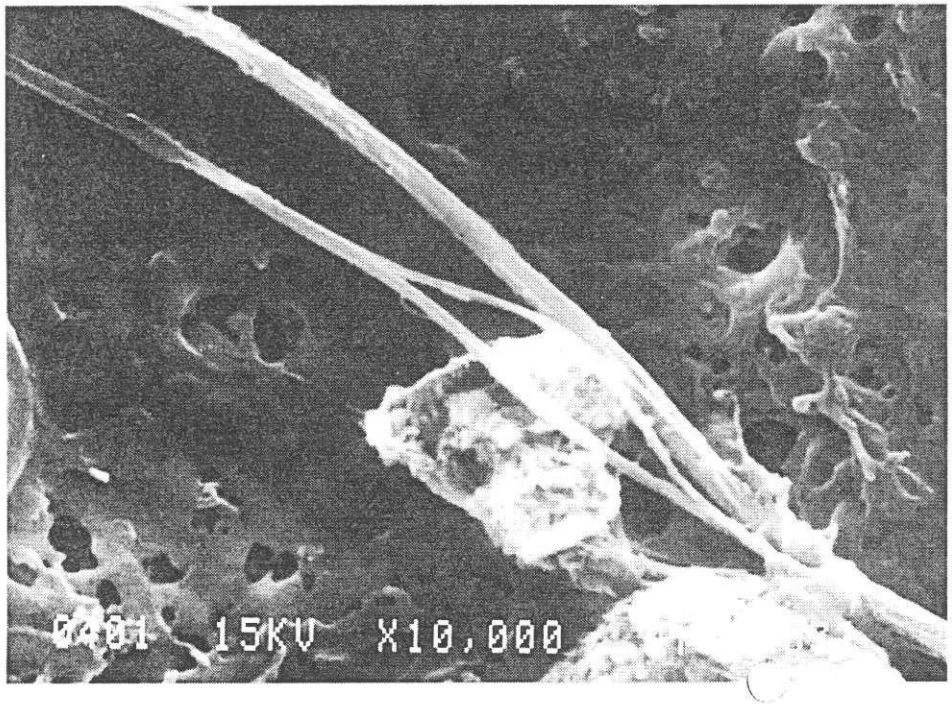
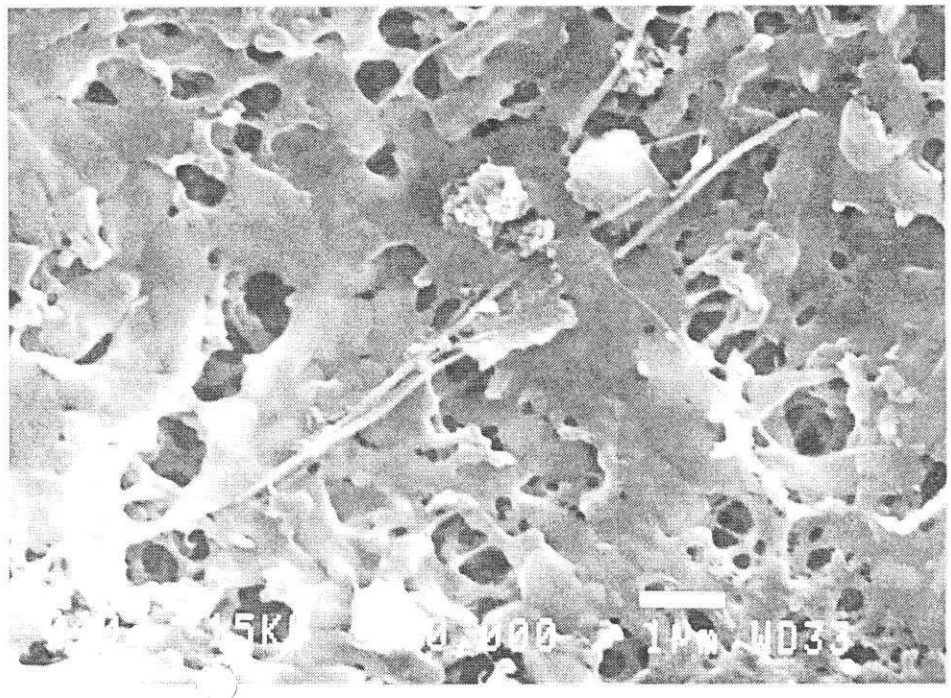


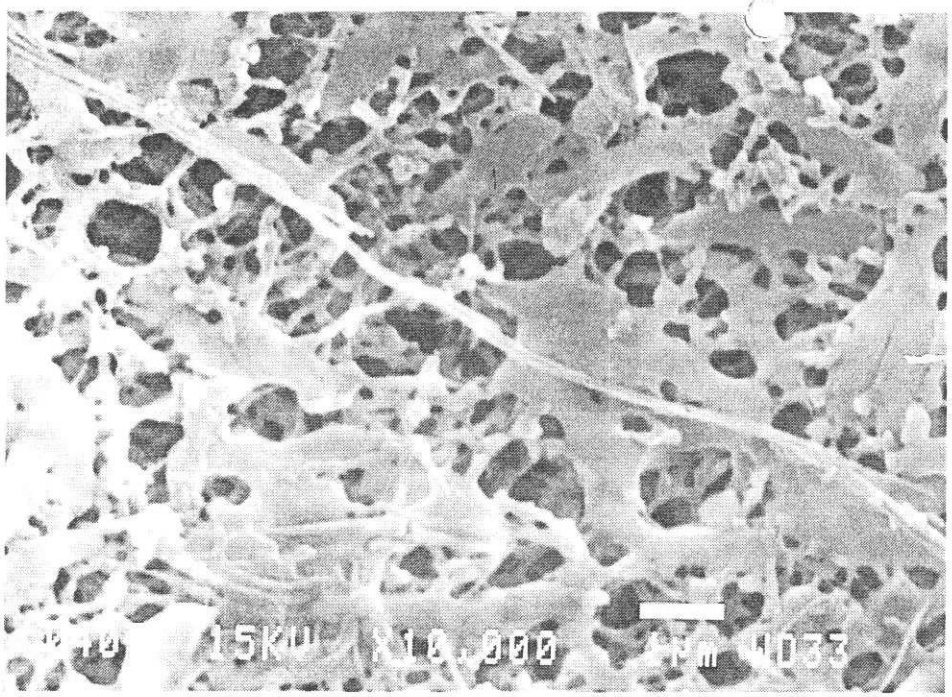
1101 ▶



◀ 0401



0402 ▶



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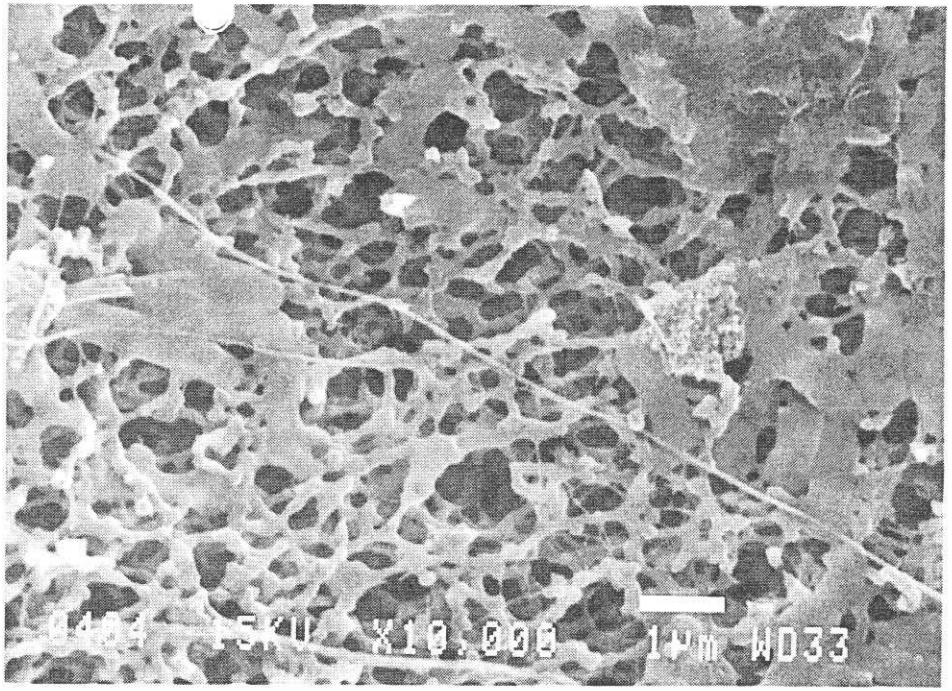
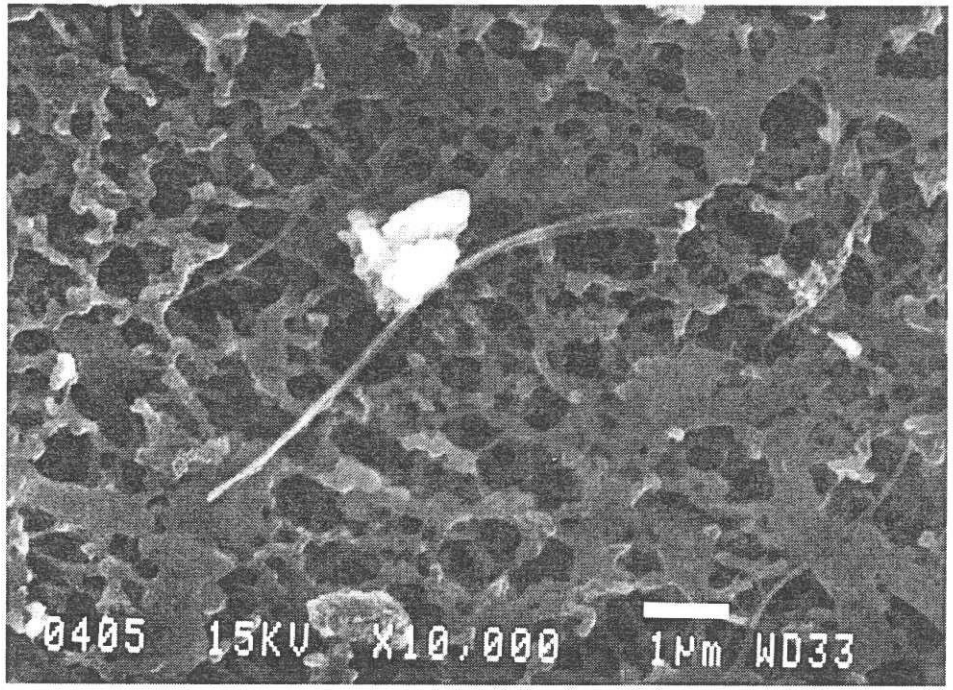


0404 ▶



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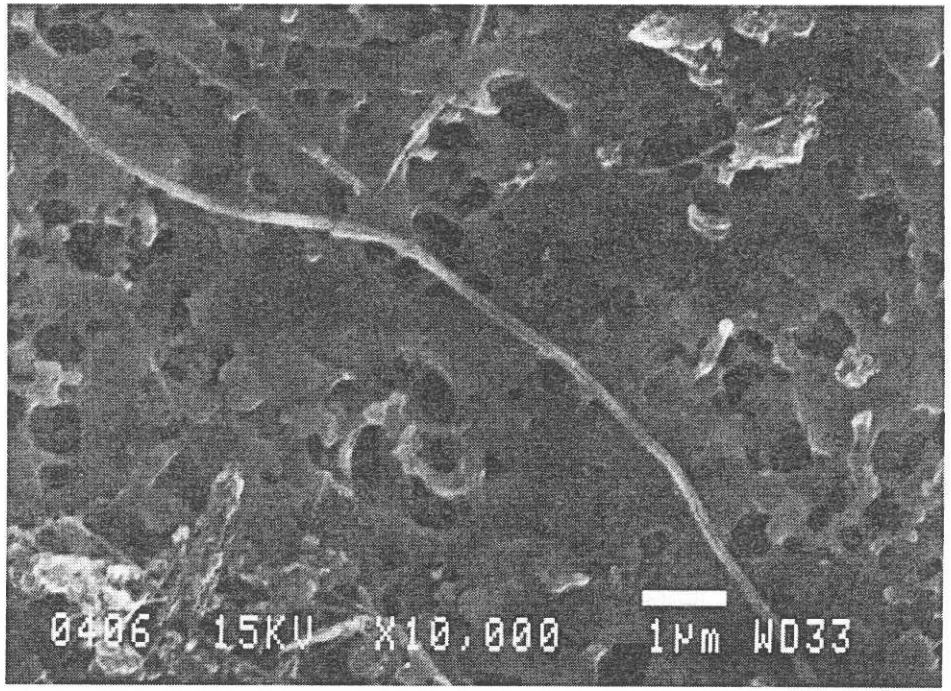

0406 ▶