AEI SCIENTIFIC APPARATUS INC.
647 SO KINGERY HIGHWAY - ROUTE 83
ELMHURST, ILLINOIS 60126
TELEPHONE 312 279-2440

PLAINTIFF'S
EXHIBIT
FD-235

April 5, 1971

Erwin Eichen, Ph.D.
Ford Research Laboratories
Ford Motor Company
Dearborn, Michigan

Dear Dr. Eichen:

Attached is a detailed report on asbestos analysis showing quantitative information.

You will note that it is easy to decide which form of asbestos is present.

I hope this will be of further value in evaluating EMMA-4.

Best regards,

Tom

Thomas Leach
Representative

TL/bl
Enclosures

8000 0445

81.114

PRODUCED BY FORD

AEI

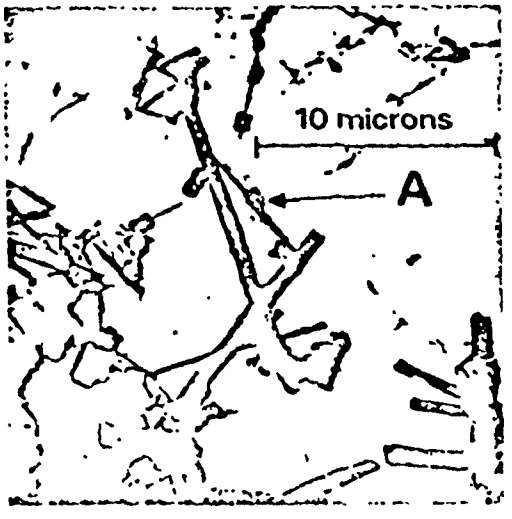
analytical electron microscope application

medical

asbestosis in human lung

Electron micrographs and spectrometer plots showing presence of AMOSITE asbestos fibres in human lung tissue

Transmission electron micrograph



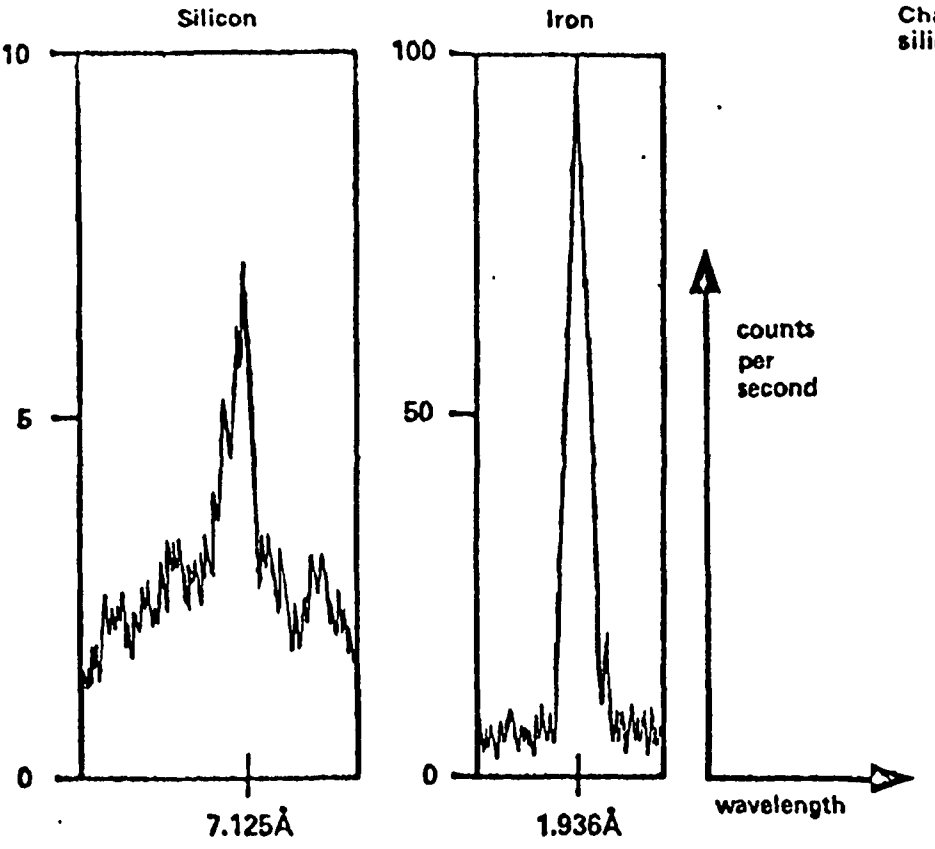
An example of the application of the EMMA-4 technique in medical research concerns the study of asbestos fibres extracted from human lungs Recent work in several laboratories has demonstrated the danger of inhaling such fibres and has shown that the ill-effects may not manifest themselves until many years after the inhalation The problem therefore arises of establishing to which group of the asbestos materials particular extracted fibres belong, in order to be able to relate this to the lung damage and also to trace the source. The figure illustrates the type of results obtained with the new instrument. The transmission image shows the fibres on this sample, a lung tissue section, to be down to about 1000Å in thickness – often with "trains" of growth along them (top centre of the image) – and with a wealth of both surface and internal detail which can only be resolved in a transmission electron micrograph The direct spectrometer output in the form of peaks plotted for iron and silicon K radiations from the fibre A is also shown in the figure. Simply by measuring fibre composition in the form of element ratios from such peaks it is possible to identify these particular fibres as AMOSITE asbestos Further confirmation can be obtained by electron diffraction, if required

The essence of the problem posed by this particular specimen, i e the correlation of chemical, morphological and crystallographical information on a sub micron scale is, of course, very general and it is for this reason that the scope for application of the new instrument is likely to be very widespread

81-118

8000 0446

PRODUCED BY FORD



Characteristic peaks plotted for silicon and iron from fibre A.

The new Analytical Electron Microscope, EMMA-4, has facilities for loading 6 specimens in one holder, and accurate selected area diffraction combined with high-resolution electron microscopy and high-sensitivity microanalysis

For further information see Publication 2040-10 describing the unique performance of EMMA-4.

Acknowledgement The work described was carried out at Tube Investments Research Laboratories on the combined electron microscope/microanalyser

AEI Scientific Apparatus Ltd
P.O. Box 1
Harlow Essex England

PQ 8000 0447

PRODUCED BY FORD

Anthophyllite (single fibre) $(Mg,Fe)O.SiO_2$

MAR 29 RECD

	Fe	Si	Al	Ca	Mg	Na
peak	1270	3009	4	57	144	1
background	14	9	4	2	3	2
P-b	1256	3000	-	55	141	-
Continuum	66	71	70	79	75	72
	✓	✓	x	✓	✓	x

Peak = no. of x-ray counts collected in 10 seconds with the spectrometers set at the characteristic (peak) wavelength position for that element.

background = no. of x-ray counts in 10 seconds at a wavelength position away from the peak.

P-b = true no. of x-ray counts for that element concentration, but this has to be corrected for spectrometer efficiency etc.

Continuum = the white radiation collected in the non dispersive detector to monitor the mass thickness of the specimen.

The results show the presence of Fe, Si, Ca and Mg but Al and Na were not detected.

8000 0448

81.119

PRODUCED BY FORD

Crocidolite $3H_2O \cdot 2Na_2O \cdot 6(Fe,Mg)O \cdot 2Fe_2O_3 \cdot 17SiO_2$

	Fe	Si	Al	Ca	Mg	Na
P	9813	4823		55	19	1
b	70	15		3	3	-
P-b	9743	4808		52	16	1
Continuum	116	146		116	113	164
	✓	✓		✓	✓	?

Amosite $FeO \cdot SiO_2 \cdot xH_2O$

	Fe	Si	Al	Ca	Mg	Na
P	14750	2888	9	69	38	2
b	60	20	4	4	2	-
P-b	14690	2868	5	65	36	2
Continuum	136	140	196	179	162	203
	✓	✓	?	✓	✓	?

Variations in the continuum count are due to the single fibre moving slightly under the probe for different readings.

Where small quantities of elements are suspected, e.g. Na, x-rays can be counted for longer periods of time, e.g. 100 seconds or more, to obtain more quantitative results.

8000 0449

PRODUCED BY FORD

Chrysotile $3MgO.2SiO_2.2H_2O$

	Fe	Si	Al	Ca	Mg	Na
P	279	1150	11	27	72	1
b	9	5	2	3	3	1
P-b	270	1145	9	24	69	-
Continuum	53	56	72	62	64	75
	✓	✓	✓	✓	✓	?

The results show a variation in relative element concentration between different fibre, and could be corrected against solid standards to obtain quantitative results. This technique is therefore valuable in determining the different types of asbestos found in lung diseases. Elements detected other than given in the chemical formula could be surface impurities or crystalline interstitial substitutions.

B000 0450

PRODUCED BY FORD