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REPORT No. R-2594

DATE 12 February 1940

SUBJECT

*FR-1594*

Test of Lycalex

Submitted by the Lycalex Corporation of America



DECLASSIFIED by NRL Contract

Declassification Team

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NRL Report No. R-1594

NAVY DEPARTMENT

Report of Test

of

Mycalex

Submitted by the Mycalex Corporation of America

NAVAL RESEARCH LABORATORY  
ANACOSTIA STATION  
WASHINGTON, D. C.

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Authorization: BuEng Let. F42-1(11-3-DR1) of 16 January 1940.

Date of Test: 21 January to 6 February 1940.

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AUTHORIZATION

1. The work reported herein was authorized by Bureau of Engineering letter, reference (a). References (b) and (c) are also pertinent to this problem.

Reference: (a) BuEng let. F42-1(11-3-DR1) of 16 January 1940.  
(b) Specifications RE 13A 317F.  
(c) NRL Report No. R-1205, "Test of Micalex Insulating Material," dated 17 October 1935.

OBJECT OF TEST

2. The object of the test was to determine whether the sample of Micalex submitted for test complies with the requirements of specifications, reference (b), and is suitable for Naval use.

ABSTRACT OF TEST

3. The dielectric constant and the power factor of the material were measured at a frequency of 300 kilocycles both before and after the sample had been immersed in distilled water for 96 hours.

4. The moisture absorption of the material was determined by accurately weighing the sample after it had been immersed in distilled water for 100 hours during which time the water was boiled four times, and again after the sample had been dried out in an oven maintained at a temperature of 120° C for 24 hours.

5. The density of the sample was determined, since it is called a light weight material, and its machinability was also checked.

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Conclusions

(a) This Mycalex sample complies with specifications, reference (b), as Grade F insulation in regard to loss factor.

(b) The moisture absorption by weight is slightly in excess of the allowed value of 0.10 per cent. However, the sample is quite thin and the surface area per gram of weight is greater than that of most samples submitted for test.

(c) This material is satisfactorily machinable.

(d) Its density is 2.45, which is somewhat below that for the usual material of the same general type (Westinghouse Insanol has a density of 3.38).

(e) This material is considered suitable for Naval use as Grade F insulation.

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Recommendations

(a) It is recommended that this Mycalex be considered suitable for Naval use as Grade F insulation.

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6. The material under test consisted of one plate of Mycalex submitted by the Mycalex Corporation of America. This sample is understood to be iodide potassium base material manufactured in the United States. The sample was 3-1/2 inches square and approximately 0.2 inch thick.

METHOD OF TEST

7. In the loss factor test the sample was coated with foil electrodes of the same size as the plate, which electrodes were made to adhere to the sample by the use of a few drops of petrolatum. The dielectric constant and the power factor of the condenser thus formed were determined by the parallel substitution method at a frequency of 300 kilocycles, as specified in paragraph 6-1 of reference (b). Measurements were made on the sample as received and again after it had been immersed in distilled water for 96 hours and its surfaces wiped dry. The latter measurement was made within 2 to 5 minutes after the sample had been removed from the water. The loss factor referred to in the specifications, reference (b), is a product of a dielectric constant and the power factor in per cent measured in the wet condition described above.

8. In the moisture absorption test a plate 2-1/2 inches square with all edges newly sawed was immersed in distilled water for 100 hours and the water was boiled during the first, twenty-fifth, twenty-ninth, and seventy-third hours as detailed in paragraph 6-2 of reference (b). Upon removal from the water, the surface moisture was removed by wiping the sample with a dry cloth and then quickly dipping it once in pure alcohol and then in ether. The wet weight was obtained immediately on a precision balance. The dry weight was taken after the sample had been heated in an oven at 120° C for 24 hours and cooled in a desiccator to room temperature.

9. The machinability of the sample was checked by drilling and tapping holes, milling a slot, sawing off a narrow strip, and counterboring a hole.

DATA RECORDED DURING TEST

10. The data recorded during the test or values computed therefrom are given in Tables 1 and 2, and under RESULTS OF TEST.

DISCUSSION OF PROBABLE ERRORS

11. The error in the loss factor is believed to be less than  $\pm 10$  per cent. The error in the determination of the weight of the sample in the moisture absorption test is not greater than  $\pm 0.0002$  gram.

RESULTS OF TEST

12. Loss Factor. From Table 1 it will be noted that the loss factor of the sample measured wet as specified in paragraph 6-1 of reference (b) is 4.8. This material therefore qualifies in this respect as Grade F insulation, since the loss factor lies between 1 and 7.

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13. Moisture Absorption. The gain in weight due to the moisture absorption was 0.42 per cent, whereas the specification limit is 0.10 per cent. In previous measurements of the moisture absorption of Mycalex, it had been noted that if the dry weight of the sample was obtained before the 100-hour immersion, the material actually lost weight instead of gaining, due to deposit of sediment which weighed more than the absorbed moisture (see reference (c), paragraph 10 and Table 1). For this reason the wet weight was determined before the dry weight in the present instance and not afterward as detailed in paragraph 6-2 of reference (b). Furthermore, this sample is quite thin and its surface area is considerably greater than that of most samples submitted for test, and the gain in weight is probably somewhat greater than for a thicker sample of the same material. The moisture absorption increased the loss factor to four times the dry value as shown in Table 1 appended.

14. Machinability. From observation of the material after drilling and tapping it, counterboring a hole, milling a narrow slot, and sawing a strip off one edge, it is believed that this material is satisfactorily machinable.

15. Density. The density of this sample was measured to be 2.45 (see comment under CONCLUSIONS).

## CONCLUSIONS

16. This Mycalex sample complies with specifications, reference (b), as Grade F insulation in regard to loss factor.

17. The moisture absorption by weight is slightly in excess of the allowed value of 0.10 per cent. However, the sample is quite thin and the surface area per gram of weight is greater than that of most samples submitted for test.

18. This material is satisfactorily machinable.

19. Its density is 2.45, which is somewhat below that for the usual material of the same general type.

20. This material is considered suitable for Naval use as Grade F insulation.



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Table 1

## Loss Factor Data

<u>Dielectric Constant</u>		<u>Power Factor - %</u>		<u>Loss Factor</u>	
<u>Dry</u>	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>
6.2	6.2	0.18	0.77	1.1	4.8

Table 2

## Moisture Absorption Data

<u>Weight - grams</u>		<u>Gain in Weight</u>	
<u>Wet</u>	<u>Dry</u>	<u>Grams</u>	<u>%</u>
47.201	47.140	0.061	0.129

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