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R. 522

**COMALCO ALUMINIUM (BELL BAY) LTD: REFRACTORY
SAMPLES FROM CARBON BAKING FURNACE****Samples**

Following discussions with Mr Ian Reid of Comalco Aluminium (Bell Bay) Ltd, two samples of refractory material were received for fusibility testing.

Sample No. 1 consisted of several pieces of firebrick which had been exposed to operating conditions in the arch of the furnace.

Sample No. 2 consisted of two moulded specimens of refractory to be installed in the furnace.

It was stated by Mr Reid that the refractory was specified not to melt below 1660° C (3030° F), but under operating temperatures of approximately 1440° C failure had taken place.

With regard to fusibility tests, it was suggested that determinations be made under both oxidizing and reducing conditions.

Testing*Sample No. 1: Firebrick ex Furnace*

A segment was heated to 1500° C in an enclosed gas fired muffle furnace, and held at this temperature for 30 minutes. Examination of the test piece showed that fusion of the bond material had taken place while the fragments of grog were unaffected. Under these conditions the test piece—about 2½ inches in height on a base of ¾ inch by ¾ inch—was still able to support its own weight, and observation of the softening point was therefore not possible.

A series of tests on individual specimens was then undertaken to observe the behaviour of the material in the temperature range 1250° C to 1500° C.

The tests were performed in an electrically heated tube furnace. For work in a reducing atmosphere, a current of town gas was passed through the tube.

The results of these tests were as follow:—

<i>Temperature (° C)</i>	<i>Observations</i>
1250	Material unaffected.
1300	Slight fritting.
1350	Fritting more pronounced.
1400	Fusion of bond material.
1500	More complete fusion of bond material with fluidity becoming apparent. "Grog" particles unaffected.

The above tests were performed under oxidizing conditions. No significant difference in behaviour was observed during heating in reducing atmospheres.

Sample No. 2: "New" Material

A similar series of experiments was performed on this sample but under oxidizing conditions only. Results of tests were similar to those outlined above.

Summary

The material consists of two components, a bonding agent which has a softening point between 1350° C and 1400° C and "grog" which is apparently unaffected at 1500° C.

It is suggested that the refractory is unlikely to withstand temperatures in excess of 1400° C.