PLAINTIFF'S EXHIBIT
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Mr. R. F. Carter/3 Pittsburgh 7

FR: R. G. LaBAR
CERAMICS SECTION
ALCOA TECHNICAL CENTER - B

MEMORANDUM

1978-03-06

MAR 10 1978

DATA LETTER

RE: JOHNS-MANVILLE'S IMPROVED MARINITE XL

Summary

As a result of a phone conversation with Walter Pusch in early September (1977), four sheets of an improved Marinite XL were received for evaluation. Mr. Pusch informed me at the time that J-M had just processed the material and found it to be more resistant to elevated temperature than the standard XL and that preliminary tests in molten aluminum looked very encouraging. Since receipt of the material on September 27, it has been verified that it is more refractory and is quite resistant to molten metal. However, the strength/density ratio is lower than that of Molten Metal Marinite and we have not successfully cast HDC sheet ingot with it due to cracking of the headers which is attributed to the lower ratio. Otherwise, the material has been used successfully to cast 229 mm FDC ingot.

Introduction

The improved Marinite XL was received in heat treated form and later designated as being Marinite MM. J-M reported that the material is more brittle than Molten Metal Marinite and that fabricating techniques may have to be modified to achieve satisfactory results. It was the objective of this study to quantify its thermal stability, corrosion resistance, machinability, and performance as headers.

Experiments and Results

1. Thermal and Chemical Corrosion Resistance

In addition to obtaining physical properties from the as-received board, tests were run to determine moisture content and shrinkage. The data, Table I, show that the material is stable up to 705°C (1300°F) but that when heated to 815°C (1500°F), the shrinkage is excessive. Additionally, in the modified "B-Immersion Test" (two cycles of immersion in 7075 alloy at 760°C (1400°F) for 24 h), it was noted that the portion of the specimen immersed did shrink and crack. The metal skull was easily removed after the first cycle but not so easily after the second. A layer of fines was attached to the skull each time. The result is quite similar to that observed using M.M. Marinite.

Headers for casting 229 mm FDC round ingot were machined by the ATC Machine Shop and ingot were cast (and are still being cast) by the Ingot Casting Division. Surface quality of high and low magnesium alloy ingots was excellent. Similarly, headers for casting 508 mm X 1092 mm 5182 alloy sheet ingot were also prepared and shipped to Building 210. One of two headers machined broke in transit from ATC to Arnold. The other header was assembled in the mold using the standard procedure. Ingot cracks and surface tearing were encountered soon after attaining designed casting rates (114 to 121 mm/min). Autopsy of the mold revealed numerous cracks, some of which existed during casting and others formed during cooling. The second header was installed, even though it had cracked in one place during shipping, and run. Again, more cracks formed during running with results similar to the first run.

2. Machinability and Physical Properties

The comments from the machinist who prepared the FDC headers indicate that while the material is more brittle and tends to chip if machined through rather than machining halfway through from one side and then cutting in from the opposite side, it can be machined with a satisfactory surface. There were no problems encountered in machining the sheet ingot headers. The brittleness is attributed to the lower strength/density ratio of 10.8 as compared to that of Molten Metal Marinite, 25-28.

Safety Statement

This material contains glassy fibers and $CaO \cdot SiO_2$ (Wollastonite) which as dusts are a nuisance and may cause skin irritation. Long sleeve shirts, approved dust masks, and dust collectors are recommended during machining operations.

Conclusions and Recommendations

1. The favorable test results and casting evaluations on the FDC unit justify additional evaluation. The entire inventory of the product in J-M's plant has been requisitioned by ATC for subsequent sampling to selected plants.

2. It is recommended that trials on HDC sheet ingot not be made until another plant run by J-M has been accomplished and the material evaluated at ATC.

3. It is recommended that the material be evaluated as backboards (feed boards), basin linings, dams, floats, and construction of short trough assemblies for small HDC extrusion ingot.

Future Programs

1. It is suggested that J-M be encouraged to rename the product and not use the word Marinite.

2. Works trials will be monitored and the results disseminated to J-M, hopefully, in support of another plant run.

R. G. LaBAR

RGL:bls

Attachment

cc: ID - ATC, D
E. L. Rooy - Pittsburgh 23
D. L. Schaffer - Pittsburgh 23
A. J. Sartschev - Pittsburgh 3 WPH
J. Z. Nelson/H. W. Cooley - Pittsburgh 3 WPH
R. W. Wrenn - Pittsburgh 23
M. J. Caprio - Pittsburgh 19
R. P. Carter - Pittsburgh 7
K. J. Brondyke - ATC, C
R. E. Spear - ATC, C
G. K. Turnbull - ATC, B
J. H. Dudas - ATC, C
H. A. Traenkner - ATC, D
J. E. Hines - ATC, B
L. K. Hudson/Ceramics Section File 10.320

TABLE 1

IMPROVED MARINITE XL

THERMAL AND PHYSICAL PROPERITES

Physical Properties — Bulk Density = 1040 kg/m^3 (65 pcf)

Properties After Firing to:	Modulus of Rupture MPa (psi)	Shrinkage %	Weight Loss %
590°C (1100°F)	4.86 (705)	0.134	3.75
650°C (1200°F)	4.92 (713)	0.156	4.2
705°C (1300°F)	5.86 (850)	0.183	4.5
815°C (1500°F)	4.77 (691)	2.11	4.85

Modified "B" Immersion

Weight Retained = 94%

Rating = Good - Excellent

R.G. LaBAR
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