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TEST OF TITANIA SLAG AS CORE WASH MATERIAL

by

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SUMMARY OF RESULTS

Three samples of crushed titania slag were tested to determine their suitability for use in foundry mould and core washes.

There was no significant differences observed in the quality of castings produced by cores washed with the three different samples. The most finely ground sample was the most easily applied.

The samples of titania slag appeared to be as useful in core and mould washes as were zircon and silica flour. They had an advantage over silica flour in that they are not injurious to health, so far as is known.

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INTRODUCTION

On December 9, 1958, a letter was received from Mr. M. Trottier, Quebec Iron and Titanium Corporation, P. O. Box 40, Sorel, P. Q., requesting tests to determine the suitability of titania slag for use in mould and core wash formulations.

The last of three samples submitted for test was received on January 19, 1959. The samples were identified as follows:

(1) -65 mesh, 70-72% TiO_2

(2) -65 mesh, 74-75% TiO_2

(3) -200 mesh, 74-75% TiO_2.

The analyses and screen distributions, supplied with the samples, were:

	1.	2.	3.
TiO_2	71.3	74.4	75.8
FeO	13.6	9.4	9.2
Tyler Screen No.	Percent Retained		
65	0	0	0
80	0.4	0.3	0
100	2.8	4.1	0
150	34.1	32.5	0
200	15.9	14.8	0
250	7.9	13.0	-
325	19.8	14.8	27.1
-325	19.1	20.5	72.9

In addition to the three samples of titania slag two commercial materials commonly used in mould and core washes were tested, to form a basis of comparison with the titania slags. These materials were silica flour and zircon flour, each crushed to -200 mesh.

WASH FORMULATION

The five powders were each suspended in a slurry of western bentonite and water in a ratio of 38.5 gm bentonite per litre of water. Powder was stirred in until the mixture was judged to have a good consistency for application. The amounts used, together with the specific gravities of the resultant mixtures, were:

	Volume of Bentonite Slurry, cc.	Wt. of Powder, gm	Spec. Grav.	Baume
70-72%, -65 mesh	400	800	2.02	73.5
74-75%, -65 mesh	400	800	2.02	73.5
74-75%, -200 mesh	400	800	1.96	71
Zircon flour	400	943	2.24	80
Silica flour	400	523	1.57	52.5

APPLICATION

When the cores were dipped in the washes they were all about equally easy to apply, but when they were swabbed or sprayed the washes made from the fine powders were more easily applied than were those from the coarse ones. The zircon flour was ground more finely than the other powders, and it was the most easily applied. The silica flour and -200 mesh titania slag were about equal in their ease of application, but they did not go on as smoothly as the

zircon wash. The -65 mesh titania slags were unsatisfactory for swabbing or spraying, because the resultant castings were too rough and uneven in thickness.

Another advantage of finely ground powders in core and mould washes is that there is less settling on standing, and they do not require so much stirring.

TEST CASTINGS

Two patterns were used in making test castings. These were: (1) A four-legged keel block, and (2) a 36-inch high, 6-inch diameter cylinder with four $1\frac{1}{2}$-inch diameter cores inserted in the bottom.

Test castings were all poured in mild steel at $1620^{\circ}C$ ($2950^{\circ}F$).

KEEL BLOCKS

The moulds for the keel blocks were made from the following mixture:

150 pounds Ottawa "45" sand (AFS fineness No. 64)

12 pounds silica flour

$2\frac{1}{4}$ pounds gelatinized corn flour

$2\frac{1}{4}$ pounds core oil

Baked $400^{\circ}F$ for 3 hr.

The washes were sprayed on these moulds. Two different washes were used on each keel block. Examination of the two pairs of keel block legs thus gave a good comparison of the effectiveness of the washes used on that mould.

There was no noticeable difference among the core washes in the surface they produced on the keel blocks.

The silica flour wash peeled the most easily from the casting surface, and the titania slags were the most difficult to remove.

PENETRATION CASTING

The following core mixture was used for the cores in the penetration casting:

900 gm New Jersey AFS fineness No. 62

100 gm silica flour

10 gm AFS reference linseed oil

Baked 400F for 1½ hr.

The cores were dipped in the core washes.

As with the keel blocks the castings were poured in mild steel at 1620C (2950F).

None of the washes prevented the cores from penetrating under the 36-in. head of metal.

DISCUSSION

The tests indicate that as core and mould washes silica flour, zircon flour, and titania slag are all about equal in the surface finish they produce. However, silica flour has a serious health hazard, and for this reason zircon flour is often preferred for steel.

The fineness to which the powder is ground does not appear to have much effect on the casting finish. However, the finer materials do not settle out from the mixture, and are more easily applied than the coarse materials. Zircon flour was the finest material tested, and the most easily applied.

The 36-inch high head used in the penetration casting is a very severe test, and it would not be expected that mould washes would prevent penetration in this test. It was used to determine if the titania slag possessed unusual properties which would help prevent penetration. This was not found to be the case.

The wash formulations used in these tests are not necessarily recommended for commercial use, but they do appear to give a good indication of the relative effectiveness of the different materials as core and mould washes.

CONCLUSIONS

1. Mould wash made from titania slag appears to produce steel castings with as good surface finish as does wash made from zircon flour. However, it does not peel from the casting as readily as zircon wash, which is a disadvantage.
2. The difference in analysis between the 71.3 and 75.8% TiO_2 did not produce a significant difference in the performance of the wash.
3. The finely ground material was the most easily applied. An even finer grind than the -200 mesh sample would improve the wash in this respect. However, the fineness of grind did not have a significant effect on casting finish in the above tests.

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