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TREATMENT OF LORRAINE SHALE TO OVERCOME SCUMMING

by

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Treatment of Lorraine Shale to Overcome Scumming

INTRODUCTION

In the production of building brick and tile at Cooksville, Ontario, the Cooksville Co. Ltd. reported the recent occurrence of scum on some of their ware. The raw material used at this plant is Lorraine Shale which carries some soluble salts, and in the past it has been customary to add a small proportion of barium carbonate to prevent scumming. This method of treatment proved successful until recently, but now it is reported that scum continues to persist in some cases even with twice the normal addition of barium carbonate.

The problem outlined was referred to the Ceramic Section in Ottawa with a request for technical assistance, and a 25 lb sample of shale from the Cooksville plant was submitted for the investigation.

EXPERIMENTAL PROCEDURE

Specimen briquettes were prepared from Cooksville shale, Sample #181, ground to minus 16 mesh, with and without additions of barium carbonate, barium fluoride, and soda ash. Compositions A, B, C, & D in Table 1 were tempered to plastic condition with 14.1% water and moulded by hand. The moulded briquettes were partially dried at room temperature followed by oven drying at 110°C

Briquettes of each composition were fired at Cone 04 (Approx. 1922°F) and subsequently tested for fire shrinkage and absorption. The fired specimens were carefully examined for colour and any appearance of scum.

Differential Thermal analysis and X-ray studies were conducted on the raw material.

Table 1 Body Compositions

Body	Composition
A	Shale with no addition
B	Shale + 0.2% barium carbonate
C	Shale + 0.2% barium fluoride
D	Shale + 0.2% soda ash

RESULTS

All briquettes were carefully examined after drying, but according to observations, no scum was detected on the unfired specimens. The results obtained on specimens fired at Cone 04 (1922°F) are recorded in Table 2.

TABLE 2. Properties of Fired Specimens

Body	Fire Shg %	Abs. %	Colour	Remarks
A	1.2	8.7	Light red	Scummed
B	1.2	9.1	Mod. red	No scum
C	1.2	9.5	Mod. red	Trace of scum
D	1.5	9.3	Mod. red	No scum

D.T.A. and X-ray Determinations

The D.T.A. curve showed a small exothermic reaction with a peak at 410°C. This was interpreted as being pyrite in amount of less than 0.5%. There was a small endothermic reaction with a peak at 800°C due to approximately 1.5% of

calcium carbonate. The sample was mainly made up of illitic or chloritic clay mineral. A large clay reaction at 600°C obscured the presence of free quartz. The X-ray diffraction indicated the presence of a chloritic clay mineral, free quartz and a mica type mineral which could be either illite or muscovite. The amount of pyrite indicated by D.T.A. was too small to show on the X-ray pattern. There was no evidence of gypsum indicated by either method.

DISCUSSION

Observations on drying failed to reveal any occurance of scum from this source. As shown in Table 2 the untreated shale was scummed, and results indicate that it occurred in the course of firing. The fired specimens with 0.2% of either barium carbonate or soda ash were free of scum, and those with 0.2% barium fluoride had only a slight trace.

Identification by D.T.A. and X-ray showed the main constituents to be clay minerals together with minor amounts of other materials including pyrite. It has been estimated that even a small amount of pyrite in the presence of soluble salts would be sufficient to produce scum in the course of firing.

CONCLUSIONS

1. It was found that specimens of Cooksville shale with no addition other than tempering water, produced scum in the course of firing.

2. Scumming was overcome by an addition of either barium carbonate or soda ash. On the sample of shale submitted, 0.2 of either additive was effective.

3. By adding 0.2% of barium fluoride the tendency to scum was reduced to a mere trace.

SM/LEG

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