The present work examines the synthesis of tricalcium aluminate (for use as a synthetic slag) from the dross produced in the manufacture of metallic aluminium in Holding furnaces. Three types of input dross were used with Al₂O₃ contents ranging from 51 to 82 wt%. Calcium aluminates were formed via the mechanical activation (reactive milling) of different mixtures of dross and calcium carbonate, and sintering at 1200°C. The variables affecting the process, especially the milling time and the Al₂O₃:CaO molar ratio, were studied. The final products were examined via DRX, SEM, TEM and Raman spectroscopy, and their chemical composition were compared with those of commercial synthetic slags.

2. SYNTHESIS OF ALUMINATES

The A:C molar ratio was varied from 1:1 to 1:3 (A= Al₂O₃; C= CaO).

3. EXPERIMENTALS RESULTS

The aluminate content increases with increasing molar ratio A:C. For a 1:3 molar ratio, the highest content of calcium aluminate was obtained for all dross studied. For this ratio, the majority aluminate is C₃A (tricalcium aluminate) whose content is 85% and 87% for dross Al-1 and Al-3 respectively, and 72% for dross Al-2.

4. CONCLUSIONS

- It is possible to obtain aluminates from the dross by reactive milling and a sintering at 1200 °C, using calcium carbonate as the precursor.
- The greatest aluminates contents are obtained from dross Al-3, the most recent, since it presents a lower content in aluminum hydrates.
- The aluminates obtained with a A:C ratio of 1:3 have high C₃A content (85% - 87%), even higher than the commercial products studied.