UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

THE RECOVERY OF SULPHUR FROM WASTE GYPSUM

by

Ryneth Nkhangweleni Nengovhela

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α :	degree of conversion
t :	time
mℓ :	millilitre
ℓ :	litre
min :	minutes
XRD :	X-ray diffraction
XRF :	X-ray fluoresence
g :	gram
M :	Molar

SUMMARY

Gypsum is produced as a waste product by various industries, e.g. the fertilizer industry, the mining industry and power stations. Gypsum waste disposal sites are responsible for the leaching of saline water into surface and underground water and create airborne dust. Gypsum waste is not only an environmental problem but has measurable economic value as well. However, all these environmental and economical concerns can be avoided should valuable/saleable by-products like sulphur and calcium carbonate be recovered from the low quality gypsum.

The aim of this project was to evaluate a process for converting waste gypsum into sulphur. The process evaluated consists of the following stages: reduction of gypsum to calcium sulphide; stripping of the sulphide with CO_2 gas and the production of sulphur.

Thermal reduction study showed that gypsum can be reduced to CaS with activated carbon in a tube furnace operating at 1100 ºC. The CaS yield was 96%. The CaS formed was slurried in water. The reaction of gaseous CO_2 with the CaS slurry leads to the stripping of sulphide to form H_2S gas and the precipitation of $CaCO_3$. The H_2S generated was then reacted in the iron (IIII) and PIPco processes to form elemental sulphur.

Sulphur with the purity between 96% and 99% was recovered from waste gypsum in this study.