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DIFFERENTIAL THERMAL ANALYSIS OF KHARIDHUNGA MAGNESITE

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ABSTRACT

The DTA curves of seven representative samples from the Kharidhunga Magnesite Deposit are asymmetric and show a sharp rise after attaining the maxima between 670 and 700 C, which indicates the siliceous nature of the magnesite. The overlapped endothermic peaks at 770 C and 860 C characterize the presence of calcite and dolomite respectively as the other impurities. The results of DTA and TG are also compared with the available data of chemical analysis.

INTRODUCTION

Essence of the differential thermal analysis lies in the measurement of one or more physical parameters that change under the action of temperature. In geological practice among different methods of thermal analysis, the valuable information about individual properties and phase composition of a mineral is obtained from DTA (Differential Thermal Analysis) and TG (Thermo- Gravimetry). The interpretation of various peaks obtained from the DTA makes it possible to identify all the minerals present in the specimen. From TG curves it is possible to find out the loss on ignition, and hence calculate the quantity of the various minerals present (Anonymous, 1981).

RESULTS OF DIFFERENTIAL THERMAL ANALYSIS

DTA curves of the specimen collected from the Kharidhunga Magnesite Deposit are generally asymmetric with one endothermic peak (Fig. 1), which corresponds to the decomposition of magnesite into MgO and CO2 (Dangol, 1988). Owing to the presence of silica, the curves abruptly rise after attaining the maxima. Only the two curves indicate the presence of other impurities. One of the curves indicates the presence of dolomite (at 770 C), while the other shows the occurrence of calcite (at 860 C). DTA of 7 representative samples are presented in Table 1. The quantity of CO2 calculated from the TG courves is shown in Table 2. The contents of Carbonates calculated from the TG and DTA curves is given in Table 3.

Table 1. DTA of the Kharidhunga Magnesite

Sample No	Endoeffects	
M21	670 C	860 C
M11	670 C	770 C
M7	690 C	-
M8	700 C	-
M14	670 C	-
M4	670 C	-
M12	700 C	-

Table 2. Quantity of CO2 calculated from TG curve

Sample No.:	Quantity of CO2
M21	37.0 + 9.5%
M11	44.4%
M7	50.2%
M8	51.2%
M14	52.2%
M4	43.0%
M12	51.8%

Table 3. Content of carbonates by calculation of % ratio

Sample No	Magnesite	Dolomite	Calcite
M21	68.6	-	21.59
M11	82.7	-	-
M7	93.8	-	-
M8	97.0	-	-
M14	97.6	-	-
M4	80.0	-	-
M12	96.8	-	-

CORRELATION OF DTA AND CHEMICAL RESULTS

Chemical analysis of the samples M7 and M12 is available (Table 4), for the rest there is none. The results of chemical analysis show that the samples M7 and M12 contain MgO 44.5% and 45.0% which correspond to 93.5% and 96.6% of magnesite, respectively.

Table 4. Chemical analysis of the samples M7 and M12

Sample Number	M7	M12
SiO2	5.5	3.6
TiO2	<0.02	<0.02
Al2O3	<0.1	<0.1
Fe2O3	<0.1	<0.1
FeO	1.76	1.0
CaO	<0.1	0.14
MgO	44.5	45.0
P2O5	<0.1	<0.1
MnO	<0.02	<0.02
Na2O	0.02	0.02
K2O	0.04	0.03
SO3	0.04	0.02
CO2	48.5	51.8

The results of chemical analysis (X1) and the differential thermal analysis (X2) are correlated in Table 5.

Table 5. Correlation of the results of quantitative determination of magnesite calculated from thermal and chemical analysis.

S/N	X1	X2	X1-X2	(X1-X2)**2
M7	93.5	93.8	-0.3	0.09
M12	96.6	96.8	-0.2	0.04

$\Sigma = 0.01$

CONCLUSIONS

Due to silica content the DTA curves are asymmetric with sharp bend after attaining the maxima (endothermic peak) between 670 - 700 C. The quantity of CO2 calculated from the TG curves varies from 43.0 to 52.2% and so does the magnesite content therein. Dolomitization in the investigated magnesite samples is not high and that greater part of CaO is found as calcite and is not connected with MgO in dolomite.

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