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XRD analysis of a TRILITE RMS board

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ORDER: Identify the composition of the sample.

DESCRIPTION OF THE SAMPLES: Board, with dimensions of 100×145 mm.

ANALYSIS METHODS: Part of the sample was ground and analyzed by X-Ray diffractometer Bruker AXS D5005 with Cu tube (λ – 1.542Å).The measuring range (2Theta) was 10.4-75°, step size was 0.04°, the measuring time on the one step was 6 s. Copper tube operating at 40 kV and 40 mA. Variable slit V12 was used. EDS (Energy Dispersive Spectroscopy, INCA Energy 350 was used) analysis of RMS samples was performed to specify the data. Obtained data was analysed by International Centre for Diffraction Data (ICDD) PDF-4 + 2014 database.

RESULTS: EDS (Energy Dispersive Spectroscopy) analysis indicated that the sample contains the following elements: Mg, Ca, K, Al, Si, C, O and S. The XRD analysis indicates that the boards consist of the following substances: Approximately 60% of the analysed samples consist of five compounds - the Diopside [$CaMgSi_2O_6$], Muscovite [$KAl_2(Si;Al)_4O_{10}(OH)_2$], Brucite [$Mg(OH)_2$], Spinel [$MgAl_2O_4$], Silicon Oxide [$SiO_2$]. Sulfur compounds not detected by XRD. Sulfur forms amorphous compounds.
Detailed composition is given in the Table 1.
Table 2 shows the elemental composition, calculated from the compounds.

Table 1 Results of the calculation of the concentration (weight %)

PDF no.	Compound name	Formula	TRILITE RMS Concentrations
01-086-2334	Calcite	Ca(CO3)	4.2%
04-009-8366	grossular	Ca3Al2(SiO4)3	3.5%
01-074-1091	Yugawaralite	CaAl2Si6O16(H2O)4	0.8%
01-074-0836	Clintonite-1M	CaMg2Al(Al3Si)O10(OH)2	4.8%
04-013-2114	Diopside; syn	CaMgSi2O6	5.0%
04-011-9020	Lime; syn	CaO	2.3%
00-048-0900	Potassium Magnesium Silicate	K2MgSiO4	6.3%
00-058-2034	Muscovite-2M1	KAl2(Si;Al)4O10(OH)2	12.0%
01-086-2344	Magnesite	Mg(CO3)	1.9%
04-013-9511	brucite; Brucite; syn	Mg(OH)2	22.9%
04-009-7699	spinel; syn	Mg0.389Al2.407O4	1.9%
04-008-8613	spinel; syn	MgAl2O4	11.9%
04-001-7850	Forsterite; syn	Mg2(SiO4)	6.2%
01-082-1838	Lizardite-1T	Mg3(Si2O5)(OH)4	2.7%
00-013-0558	Talc-2M	Mg3Si4O10(OH)2	0.3%
01-073-6375	Magnesium Aluminum Oxide	MgAl26O40	4.1%
01-073-3469	Silicon Oxide	SiO2	8.6%
04-006-0514	Cristobalite; syn	SiO2	0.7%

PDF – Database Powder Diffraction File no.;
Syn. - synthetic

Table 2. The concentrations of the chemical elements, calculated according to the compounds.

Element	TRILITE RMS Concentrations
H	0.9%
C	0.8%
O	48.0%
Mg	17.1%
Al	12.5%
Si	11.3%
K	3.7%
Ca	5.7%

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Appendix – X-Ray diffractograms of board samples.