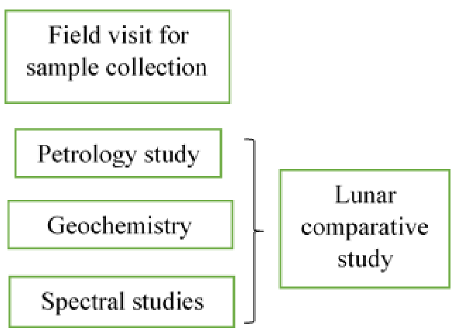
Chalk hills dunite compared to lunar (72415) dunite. Aarthy R S, Anna University (Department of Geology, Anna University, Chennai 25: rsaarthy19@gmail.com)

Introduction: To collect the lunar analogue rocks samples were collected from Chalk hills of Tamil Nadu**.** These are ultramafic-ultrapotassic-carbonatites associations occur along NE-NNE trending lineament (Tirupathur-carbonatite complex) and the ultramafic-syenite association is found along EW trending [1] Athur lineament. The complex is intrusive into the country rocks comprising gneisses, charnockites and garnetiferous mafic granulites [2]. For this study fresh rocks are encountered in quarries dunites were collected.

Methodology : Methodology adopoted for this study is given in the figure given below



Petrology: Chalk hills and Lunar dunite : Thin section composed of olivine (95%) mineral with pyroxene (2-3%) and plagioclase feldspar (<1%) and few iron oxides. While the lunar dunite composed of 93% olivine (Fo 86-89), 4 % plagioclase, 3% pyroxene [3]. The terrestrial deep plutonic olivines are zoned only at their extreme outer rims or where they are in subsolidus reaction with chromite. Olivines in volcanic rocks from both the earth and the moon have a wide range of compositions represented by zoning. The 72415 olivines are far too short for a deep plutonic origin [4]. The texture of the dunite is metamorphic and resembles the tabular texture of terrestrial ultramafic xenoliths in basalt in which olivine prisms are scattered sparsely in a granoblastic- polygonal matrix (Fig 1a,b)

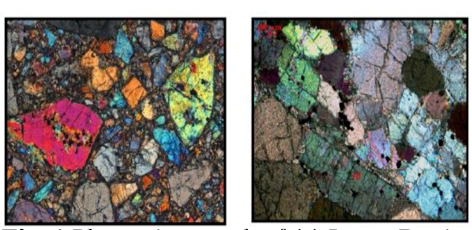


Fig. 1 Photomicrograph of (a) Lunar Dunite (sample no 72415) (Source : LPI atlas) (b) Dunite of Chalk

Chemical correlation between the earth and moon dunites: To understand the lithological evolution of the dunite and to identify the analogue of the lunar geochemical analysis was carried out. Table 1 provides the 32 dunite samples from Chalk hills with 1 lunar dunite sample. The AFM and MgO-CaO-Al2O3 (Fig. 2 a, b) of terrerstrial and lunar duintes are rich in MgO content and fraction trend is utlramafic.

Spectral studies: After identifying the Lunar-akin rocks, reflectance spectra were collected, using spectoradimeter. The laboratory spectra were compared with Lunar return sample spectra.

Remote detection of lunar rock types believed to represent exposed Mg-suitetroctolite/dunites became possible using nearIR spectroscopy. The first examples of such were the central peaks of Copernicus. Variations in olivine-plagioclase abundance seen across the central peaks suggested that Copernicus tapped a differentiated pluton that contained an olivine rich zone with varying amounts of plagioclase. The three absorptions that comprise the composite feature are labelled with the Fe^{2+} bearing crystallographic site responsible for the specific absorption at 1000nm (Fig 3a). Visible to near-infrared reflectance spectroscopy is sensitive to olivine composition, because these three absorption features shift as a function of the olivine's MgO .

Conclusion: Since olivine is thought to be associated either with the lunar mantle or with Mg-rich plutons, the origin of the olivine-rich surface units is important in developing an accurate model for the composition of the moon. Interpretations of absorption features detected in lunar reflectance spectra are based largely on the systematic laboratory study of the reflectance properties of rocks and minerals initiated by [5]. These laboratory data provide the interpretative basis the allows detection of olivine and various compositions of pyroxene from absorption features in reflectance spectra of unsampled lunar areas. The lunar and the terrestrial dunites continuum spectra removal (Fig 3b,c) were compared (Fig. 3d) and it may be observed that both are almost similar. Correlation studies between the dunite and olivine (Table 1) shows that the influence of the olivine is >90% and thus it is a typical monomineralic rock.

Acknowledgments: Thank Dr. S. Sanjeevi, Anna University. PRL, Ahmedabad.

References: [1] Selvan, T.A. Ph.D. thesis Univ. Mysore, India, 1985.
[2] Grady, J. C., Jour. Geol. Soc. India, Vol. 12, pp. 56-62, 1971
[3] Mercier , Ph. D. thesis, Univ. Nantes. 1972.
[4] Ryder, G. Proc. Lunar Planet. Sci. Conf., pp. 373-380, 1992.
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Table 1 Major oxides (wt%) of Chalk hills and Lunar (72415) dunite

Major oxides (%)	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16
SiO2	37.16	37.21	37.71	37.54	38.47	37.02	36.49	36.73	37.42	37.26	36.80	36.95	37.67	39.01	36.63	38.38
Al2O3	0.83	0.29	0.23	0.47	0.29	0.32	0.40	0.25	0.38	0.30	0.58	0.31	0.29	0.61	0.30	0.32
TiO2	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Fe2O3	15.38	14.61	14.74	16.40	14.50	15.69	15.37	17.14	16.42	16.09	15.28	17.64	12.88	12.98	15.62	14.88
MnO	0.20	0.18	0.20	0.25	0.23	0.22	0.25	0.26	0.22	0.24	0.23	0.24	0.22	0.21	0.21	0.22
MgO	41.95	43.05	44.17	41.77	45.07	42.60	42.29	41.81	42.09	43.07	41.09	40.85	43.63	45.43	41.70	43.56
CaO	0.43	0.36	0.28	0.38	0.48	0.28	0.26	0.29	0.35	0.28	0.35	0.35	0.32	0.26	0.23	0.20
Na2O	0.11	0.01	0.13	0.08	0.03	0.03	0.04	0.04	0.07	0.05	0.08	0.06	0.01	0.06	0.04	0.05
K2O	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.03	0.04	0.02	0.03	0.03	0.02	0.02	0.03	0.03
P2O5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	96.10	95.75	97.48	96.93	99.11	96.19	95.15	96.57	97.02	97.34	94.46	96.45	95.06	98.61	94.77	97.66

Major oxide (%)	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30	D31	D32	LUN
SiO2	38.05	36.26	37.23	37.13	36.25	36.69	36.74	37.48	36.94	37.37	36.52	36.26	36.77	37.84	37.38	37.73	40.60
Al2O3	0.55	0.31	0.59	0.46	0.38	0.29	0.23	0.32	0.25	0.25	0.61	0.36	0.33	0.39	0.41	0.19	1.20
TiO2	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.06	0.02	0.01	0.02	0.01	0.01	0.03
Fe2O3	15.12	16.92	15.08	14.68	15.63	14.12	14.85	13.65	13.68	15.66	16.73	15.01	13.66	13.28	14.22	14.91	11.90
MnO	0.24	0.24	0.24	0.21	0.23	0.21	0.23	0.22	0.20	0.28	0.25	0.26	0.24	0.22	0.23	0.19	0.11
MgO	42.08	40.47	41.70	41.38	40.44	42.08	41.65	43.67	42.51	42.77	39.95	41.40	42.20	43.68	42.59	43.54	45.40
CaO	0.27	0.23	0.28	0.36	0.33	0.32	0.23	0.29	0.24	0.25	0.70	0.35	0.29	0.40	0.32	0.22	1.10
Na2O	0.10	0.04	0.12	0.06	0.14	0.02	0.04	0.02	0.02	0.01	0.09	0.03	0.06	0.07	0.05	0.05	0.01
K2O	0.05	0.03	0.06	0.08	0.04	0.02	0.02	0.02	0.01	0.01	0.02	0.03	0.04	0.03	0.03	0.01	0.00
P2O5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01	
Total	96.48	94.52	95.32	94.38	93.46	93.76	94.01	95.68	93.88	96.62	94.96	93.73	93.60	95.94	95.25	96.84	100.36

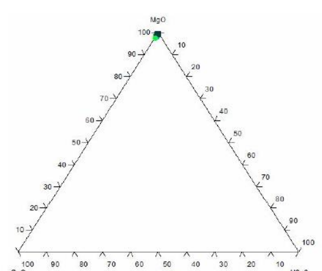
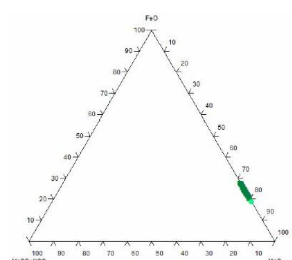


Fig 2 a. AFM



b. MgO-CaO-Al2O3 of Dunites

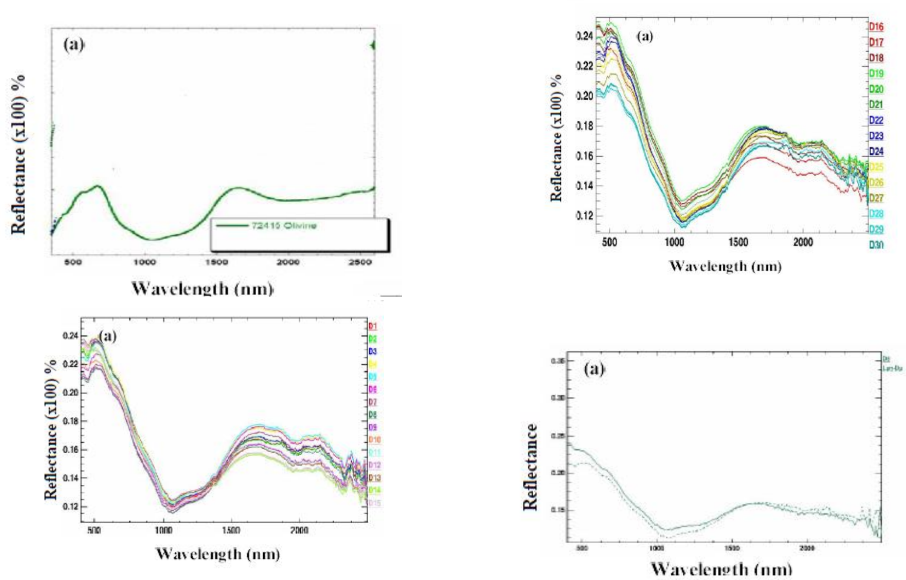


Fig 3 Reflectance spectra of a. Lunar dunite b.c. Chalk hills d. Comparative spectra