Data Article

Dataset on elemental concentration and group identification of ancient potteries from Tamil Nadu, India

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A B S T R A C T

The dataset contains concentration of major and trace elements of ancient potteries from Tamilnadu and grouping different potteries from the statistical techniques of factor and cluster analysis (Figs. 2, 3 and 4). The major and trace elemental concentration data generated using energy dispersive X-ray fluorescence technique (EDXRF) and factor and cluster analysis data obtained using STATISTICA (10.0 version) software. The concentration of major and trace elements determines the type of clay minerals (Calcareous/Non-Calcareous and either low or high refractory) and firing atmosphere adopted by the artisans at the time of manufacture. The statistical tool examined graphically the grouping pattern of the samples in terms of chemical composition and extract information about their provenance. The compilation of this data provides a resource for the wider research community in archeology.

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Specifications | Table
---|---
Subject area | Earth Science, Archaeology
More specific subject area | Archeometry
Type of data | Table, Figures
How data was acquired | Energy Dispersive X-ray Fluorescence Spectrometer (EDXRF)
Data format | Raw Analysed
Experimental factors | Powdered pottery samples were dried using hot air oven and stored in desiccators until they were analysed. One gram of the fine powder sample and 0.5 g of the boric acid (H3BO3) were mixed. This mixture was thoroughly ground and pressed to into a pellet of 25 mm diameter using a hydraulic press. The prepared pellets were analysed using the EDXRF Spectrometer.
Experimental features | Determination of elemental oxide concentration of SiO2, Al2O3, CaO, Fe2O3, K2O, TiO2 and Cu, Zn, Pb, La, Co, V, Cd and Cr of ancient potteries
Data source location | Arcot, Vellore District, Tamil Nadu, India
Data accessibility | Data is with this article

Value of the data
- Data could be used to identify the nature of clay and raw materials to production of potteries.
- Data given here could motivate the studies on ancient artifacts in future.
- Data on factor and cluster analysis provides the grouping of ancient potteries.
- The data could be more informative to researchers investigating geographical origin and ancient artifacts from the study area.

1. Data
A physical nature, period and image of collected ancient pottery samples are given in Table 1. The major and trace elemental concentration of ancient potteries are determined using the EDXRF technique and reported in Table 2. Factor loadings of major and trace elements of ancient potteries are given in Table 3 (STATISTICA (10.0 version) software). Fig. 1 shows the archeological excavation sites in the study area. Figs. 2 and 3 represent the factor analysis and Fig. 4 shows the clustering analysis of major and trace elements.

2. Experimental design, materials and methods
2.1. Sample collections
Ten pottery samples collected from the ancient settlement sites in and around Arcot of Vellore District, Tamil Nadu, India (Fig. 1). The pottery samples are excavated in 6 m depth from surface of earth. After removal of surface layers, the pottery shreds were ground into fine powder using agate mortar and then stored in polythene bag [1]. These samples are cleaned and dried using hot air oven.
2.2. ED-XRF technique

One gram of the fine ground sample and 0.5 g of the boric acid (H₃BO₃) were mixed. The mixture was thoroughly ground and pressed into a pellet of 25 mm diameter using a 20 ton hydraulic press. The instrument EDXRF used for this analysis was a PW4025 Minipal supplied by M/s Philips, Netherlands. The spectrometer was fitted with a side window X-ray tube (9 W) that had Rhodium as anode. The power specifications of the tube were 4–30 kV; 1 μA–1 mA. Removable sample changer of the instrument accommodated 12 samples at a time. Selection of filters, tube voltage, sample position and current were fully controlled by a Computer. Beam spot area (elliptical) for the instrument was 81.7 mm². The instrument had the features of Multi Channel Analyzer (MCA) test, standardless determination and

Table 1
Details of ancient potteries Arcot city, Tamil Nadu.

| S.No | Sampling sites | Sample ID | Inner color | Outer color | Approximate period |
|------|----------------|-----------|-------------|-------------|--------------------|
| 1    | Melpadi        | MP        | Red         | Red         | 900 AD             |
| 2    | Paiyampalli    | PP        | Red         | Red         | 1200 AD            |
| 3    | Thirumani      | TM        | Brown       | Red         | 600 AD             |
| 4    | Karivadu       | KV        | Black-Red   | Dark-Black  | 900-1000 AD        |
| 5    | Arcoat         | AT        | Red (nice)  | Red (nice)  | 200 BC             |
| 6    | Vallimalai     | VM        | Black-Red   | Black       | 1200 AD            |
| 7    | Kavaripakkam   | KP        | Red         | Red         | 1300 AD            |
| 8    | Panchapandavamarli | PM       | Brown-Red   | Brown       | 1500 AD            |
| 9    | Walajah        | WH        | Red         | Red         | 900 AD             |
| 10   | Udayandiram    | UD        | Red-Black   | Black-Red   | 200 BC             |

Table 2
Elemental composition of ancient potteries in and around Arcot city, Tamil Nadu, India (* in percentage; # in ppm).

| Sampling sites/element | Melpadi | Paiyampalli | Thirumani | Karivadu | Arcot | Vallimalai | Kavaripakkam | Panchapandavamarli | Walajah | Udayandiram |
|------------------------|---------|-------------|-----------|----------|-------|------------|--------------|-------------------|---------|-------------|
| Sample ID              | *SiO₂   | *Al₂O₃      | *CaO      | *Fe₂O₃   | *K₂O  | *TiO₂      | Cu           | Zn                | Pb      | Cr           |
| 1                      | 37.44   | 6.61        | 1.54      | 5.15     | 0.96  | 0.67       | 38.16        | 130.82            | 19.84   | 23.4         |
| 2                      | 41.93   | 7.75        | 2.24      | 6.43     | 1.2   | 0.83       | 52.72        | 75.72             | 25.11   | 23.4         |
| 3                      | 7.18    | 1.54        | 1.54      | 6.72     | 1.81  | 0.67       | 69.16        | 131.44            | 21.29   | 25.38        |
| 4                      | 6.24    | 1.26        | 1.26      | 8.44     | 1.33  | 0.67       | 84.92        | 131.18            | 21.76   | 25.38        |
| 5                      | 7.56    | 1.68        | 1.68      | 5.58     | 1.57  | 0.67       | 62.03        | 153.17            | 18.75   | 25.38        |
| 6                      | 6.8     | 1.26        | 1.26      | 8.44     | 1.69  | 0.67       | 83.04        | 152.93            | 19.24   | 28.09        |
| 7                      | 6.42    | 1.82        | 1.82      | 6.00     | 1.45  | 0.67       | 53.54        | 161.15            | 26.51   | 25.95        |
| 8                      | 7.37    | 1.4         | 1.4       | 7.15     | 2.05  | 0.67       | 65.65        | 106.87            | 26.35   | 25.95        |
| 9                      | 6.99    | 2.38        | 2.38      | 6.58     | 2.17  | 0.67       | 65.25        | 106.67            | 24.81   | 24.81        |
| 10                     | 8.31    | 1.26        | 1.26      | 6.72     | 2.77  | 0.67       | 41.91        | 132.12            | 22.33   | 22.33        |
|                        |         |             |           |          |       |            |              |                   |         |              |

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automatic gain correction. Gain correction was performed when the beam stop was in the reference position. Beam stop was fed with a reference sample (an alloy of aluminum and copper). Copper was used for gain correction and Al and Cu were used for calibrating instrument energy.

For elements Al, Ca, K, Fe, Si, Ti, V, Cu, Zn and Mn, the Kα lines and for Ba, La and Pb, the Lα lines were used to activate X-ray analysis. The region of interest for Co was 3.025–3.240 keV while that of Cd was 6.815–7.120 keV. For Cd and Co, the exposure time was 300 s. For elements Al, Ca, K, Fe, Si and Ti, the exposure time was 60 s. For elements Ba, Cu, Mn, Pb, V and Zn, time of exposure was 200 s.

2.3. Factor and cluster analysis

Factor and cluster analysis are used to identify pottery groups, which could be clearly differentiated from each other to establish an archeological classification. In this work, major and trace elemental data of pottery samples performed using STATISTICA (version 10.0) software package for

### Table 3
Factor loading of elemental data.

| Variables | Factor-1       | Factor-2       | Factor-3       |
|-----------|----------------|----------------|----------------|
| SiO2      | 0.256897       | 0.126844       | −0.731877      |
| Al₂O₃     | −0.268324      | −0.687692      | 0.047629       |
| CaO       | −0.488043      | 0.265709       | −0.591899      |
| Fe₂O₃     | 0.973803       | −0.076487      | −0.041148      |
| K₂O       | 0.105203       | −0.944050      | −0.092252      |
| TiO₂      | 0.336556       | 0.709427       | 0.185842       |
| Cu        | 0.908103       | 0.203992       | 0.078597       |
| Zn        | 0.372214       | 0.246369       | 0.766395       |
| Pb        | −0.013515      | −0.164244      | −0.818901      |
| La        | 0.768064       | 0.463166       | 0.388711       |
| Co        | 0.986833       | 0.021926       | 0.009225       |
| V         | 0.658077       | −0.370650      | −0.145478      |
| Cd        | 0.222314       | −0.919210      | 0.073314       |
| Cr        | 0.834465       | 0.353688       | 0.270792       |
| % of variance explained | **40.79** | **23.07** | **14.80** |

Fig. 1. Shows the archaeological sites in Arcoat, Vellore district, Tamil Nadu.
Fig. 2. Factor score 1 Vs Score 2 of elementental concentrations.

Fig. 3. Factor score 1 Vs score 3 of elementental concentrations.

Fig. 4. Cluster analysis of pottery samples.
factor and cluster analysis [2]. Figs. 2 and 3 (circles) show the concentration of elements reveals that grouping of ancient potteries.

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Transparency document. Supplementary material

Transparency data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2016.11.075.

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