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Case report

Trade and consumption of fine paste ware in Southeast Asia: Petrographic and portable X-ray fluorescence analyses of ninth- to fourteenth-century earthenware

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1. Introduction

Southeast Asia was a focal point in the development of trans-Asiatic trade and exchanges. Objects of long-distance trade with India are considered to be one of the archaeological signatures of prehistoric Southeast Asia. Indian glass beads were found at Khao Sam Kaeo and Ban Don Ta Phet in Thailand from the fourth to the second centuries BCE (Glover and Bellina 2011: 25). Recent archaeological evidence at Sembiran and Pacung in Bali has pushed back prehistoric contacts with India and Mainland Southeast Asia to the late first millennium BCE (Calo et al., 2015). Thus, the 'Age of Commerce' as coined by the historian Anthony Reid (1988: 1) appears to have been gradual development from much earlier and culminated during the fifteenth and seventeenth centuries when the urban development and commercial prosperity peaked and gave rise to political and economic changes in Southeast Asia. While the importance of the time period prior to the 'Age of Commerce' is increasingly recognized (Wade, 2009), written sources are scarce to gain insight into cultural and trade development. Archaeological data are gradually accumulating to fill the gap.

Particularly important to the understanding of trade networks is the very fine white kaolin-rich or red-slipped earthenware without visible temper found at multiple archaeological sites across the region. Many indigenous historical documents in Southeast Asia are mytho-legendary in nature and often politically motivated, leaving the economy and trade outside the focus (e.g. the court chronicle of an important Islamic kingdom in seventeenth-century Java *Sejarah Banten* (History of Banten); Riecklefs 1981: 33; Pudjiastuti 2000: 188–189; Boontharm 2003: 3–4). Object descriptions are not exceptions to this pattern. Although *kendi* ewers are often mentioned as important religious and ceremonial paraphernalia, detailed descriptions and sources of them

are lacking in documentary sources.

While documentary sources are silent about the trade of this type of earthenware, archaeologists working in Southeast Asia have supposed on the basis of visual analysis that *Fine Paste ware* (FPW) was trade goods (Miksic, 1979; Edwards McKinnon, 1984: 140; Flecker, 2002, 2003, 2005). However, multi-method scientific analysis using archaeological earthenware samples from multiple sites across the region had not been conducted. This paper aims to address one of the long-standing questions in Southeast Asian archaeology by discussing the results of petrographic and portable X-ray fluorescence (pXRF) analyses of archaeological ceramic from consumption and production sites and experimental samples of clay sourced from a kiln site (Fig. 1). By doing so, we hope to shed light on the importance of Southeast Asian trade connections and the region's own material cultural development, independent from its dominant neighbors such as India.

In recent years, archaeologists have made increasing use of pXRF analysis to investigate the trade and exchange of ceramics; the advantages of using pXRF are many including portability, non-destructiveness (Papadopoulou et al., 2006), and affordability. Portability is particularly important in the case of archaeological research in countries where the export of archaeological samples is restricted, if not prohibited. The exclusive reliance on pXRF to distinguish different clay sources, however, has also drawn a fair share of criticism (Hunt and Speakman, 2015; Speakman et al., 2011). The validity of these studies is largely dependent on the assumption that geographic relationship of raw materials corresponds to the inferred place of manufacture. One caveat to this assumption is that pottery production is multifaceted, including clay procurement, the use of temper, and firing (Bishop et al., 1982). For this reason, independent variables obtained from multiple types of studies, such as petrography and pXRF analyses could

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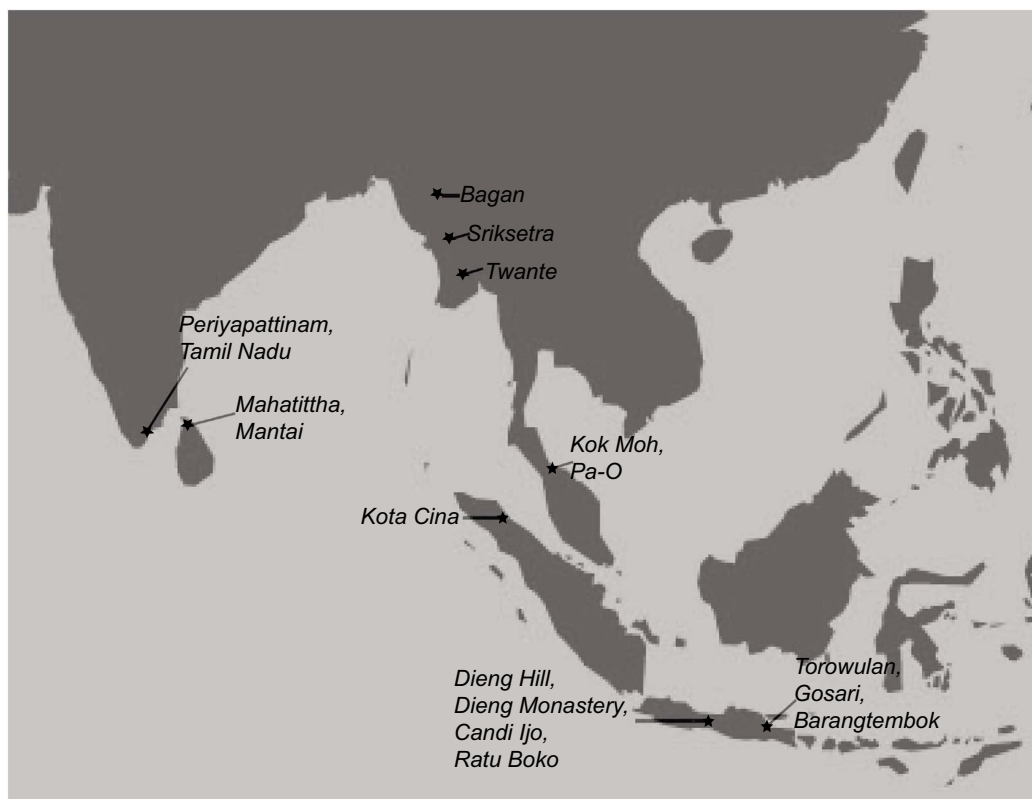


Fig. 1. Map of site locations discussed in this paper.

complement one another and cross-check the results (Fantuzzi et al., 2016; Stoltman et al., 1992; Taxel et al., 2013).

While petrographic and chemical characterization of ceramics have increasingly become part of archaeological research design in many parts of the world, scientific studies of Southeast Asian pottery are limited, and petrographic analyses are still in the inaugural stage (Ueda, 2015). Past scholarship has mainly concentrated on typologies of Southeast Asian earthenware, based on morphologies and decorations (e.g. Bulbeck and Clune, 2003; Edwards Mckinnon, 2003; Mundardjito et al., 2003; Soegondho, 2003). One exception is XRF analysis on 40 sherds from seven sites from Singapore, Thailand, Sumatra, and central and east Java, Indonesia conducted by Miksic and Yap (1990, 1992). The results of their first study suggest that at least two production centers existed, one in southern Thailand and another in east Java, and that FPW found in central Java was imported from east Java. Red and white ware from east Java possesses two distinct chemical components. The results of their second study indicate that Kota Cina FPW from Sumatra consist of two groups, at least one imported from east Java.

At first, it is important to clarify the definition of *Fine Paste ware* because the term is increasingly used to describe a wider variety of fine earthenware found in the region. We define FPW as earthenware made of fine-grained clay without visible temper, regardless of the amount of kaolin included in the clay (Miksic 1979: 185–188). Our FPW includes white fine paste ware made of near pure kaolin and red slipped hard-bodied ware made of fine-grained clay containing a smaller amount of kaolin.

The use of FPW has been widespread in Southeast Asia (Adhyatman 1987: 5), for 1500 years. The vessel shape often associated with FPW is long-necked and bulbous-bodied *kendi* ewers. The use of *kendi* drinking vessels has been widespread in Southeast Asia, covering the areas of present day Myanmar, Thailand, Cambodia, Vietnam, Sri Lanka, the Philippines, Indonesia, and Malaysia (Adhyatman 1987: 5). The rapid morphological changes of *kendi* stands out, particularly when juxtaposed against the longevity and conservatism seen in Southeast Asian cookware made of clay (Adhyatman 1987: 1), suggesting that

information flows between consumers and producers were intensive and frequent. Its development is uniquely Southeast Asian.

Archaeologically, however, other vessel shapes, such as simple spherical bowls and jars and tall vases with flanged necks have been identified (e.g. Kota Cina, Edwards Mckinnon, 1984: 141). Many of the sherds under this study are from bodies of vessels, lacking diagnostic features and making it hard to identify the vessel forms. For this reason, in this paper, we do not limit the possible vessel shapes exclusively to *kendi* although it is likely to have been an important vessel shape made of fine paste in Southeast Asia.

Southern Thailand has been cited as a probable production center, notably the Pa-O kilns in Singhanakhon district, Songkhla province, located at the southern tip of the Satingphra peninsula (Srisuchat, 2003: 255). These kilns are also known as Satingphra (Brown 1988: 127) because of their location on the Satingphra peninsula. White to gray-colored fine paste ceramic sherds were excavated at Pa-O among light orange coarser paste pottery (Srisuchat, 1999). Petrographic and XRF analysis conducted on 11 ceramic samples from the Pa-O kiln site suggest that white kaolin-rich clay was sourced from a mountain area south of Songkhla city, away from the clay deposits near the kilns used to produce light orange coarse paste earthenware. The high malleability of white kaolinic clay probably allowed producing vessels of intricate shapes, such as *kendi* ewers (Fig. 2; Srisuchat, 2003: 258–259).

2. Shipwrecks

Shipwreck records have recently become available to expand insight into trade networks in Southeast Asia (Flecker 2001: 226–227, 2003: 400–401). In the tenth century, a ship now known as the *Intan* carried a cargo of Chinese ceramics as well as fine earthenware *kendi* and bottles, stylistically identified as southern Thai (Flecker, 2002, 2005). The shipwreck is located on the maritime route to Java. The thirteenth-century *Java Sea* wreck in the same general area yielded fine paste earthenware *kendi*, similar to those found at Kok Moh kilns in the Pa-O village on the Satingphra peninsula, southern Thailand, evidenced by

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