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SURFACE PATINA AND CLAY CHARACTERIZATION: MULTI-ANALYTICAL INVESTIGATIONS INTO BIDRI HANDICRAFT

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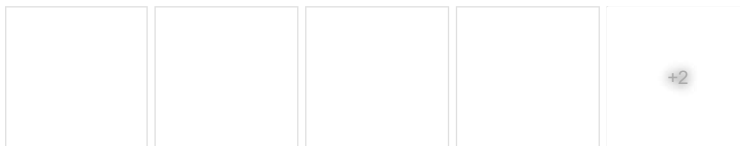
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Abstract and Figures

Bidri handicraft in India, patronised by Bahamani kings, dates back to the fifteenth century and is nowadays under operational and socio-economic threats. The craft is made of zinc alloy, which poses scientific challenges in the areas of metallurgy, metal oxidation, and surface science. In the present paper, the art, owing to its scientific enigma, is under scrutiny, wherein the handicraft mandates the use of Bidar Fort (in Karnataka, India) clay, which bestows the handicraft its characteristic matt-black patina. The fort is a heritage conservation site and thus poses a threat to the perennial practice of handicraft. Therefore, it is imperative to document the patina and fort clay. Thus, morphological and chemical characterization of Bidri artefact surfaces was accomplished using scanning electron microscopy (SEM), X-ray Diffraction (XRD) analysis, X-ray Photoelectron Spectroscopy (XPS), and Energy Dispersive X-ray fluorescence spectroscopy (ED-XRF); besides, elemental characterization of Bidar fort clay was accomplished using SEM coupled with energy dispersive X-ray spectroscopy (EDS). This study is significant, as it is one of the initial works to scientifically document Bidri handicraft surface and clay, besides laying the foundation for future studies; a step to conserve the handicraft; and a step to prevent the deterioration of the Bidar fort monument.



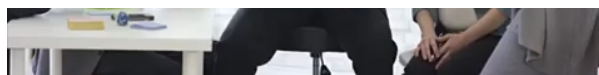
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**SURFACE PATINA AND CLAY CHARACTERIZATION:
MULTI-ANALYTICAL INVESTIGATIONS INTO
BIDRI HANDICRAFT**

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Abstract

Bidri handicraft in India, patronised by Bahamani kings, dates back to the fifteenth century and is nowadays under operational and socio-economic threats. The craft is made of zinc alloy, which poses scientific challenges in the areas of metallurgy, metal oxidation, and surface science. In the present paper, the art, owing to its scientific enigma, is under scrutiny, wherein the handicraft mandates the use of Bidar Fort (in Karnataka, India) clay, which bestows the handicraft its characteristic matt-black patina. The fort is a heritage conservation site and thus poses a threat to the perennial practice of handicraft. Therefore, it is imperative to document the patina and fort clay. Thus, morphological and chemical characterization of Bidri artefact surfaces was accomplished using scanning electron microscopy (SEM), X-ray Diffraction (XRD) analysis, X-ray Photoelectron Spectroscopy (XPS), and Energy Dispersive X-ray fluorescence spectroscopy (ED-XRF); besides, elemental characterization of Bidar fort clay was accomplished using SEM coupled with energy dispersive X-ray spectroscopy (EDS). This study is significant, as it is one of the initial works to scientifically document Bidri handicraft surface and clay, besides laying the foundation for future studies; a step to conserve the handicraft; and a step to prevent the deterioration of the Bidar fort monument.

Keywords: Surface patina; Clay characterization; Bidri Handicraft; Bidar fort; Zinc-copper alloy; Clay oxidative properties

Introduction

India is one of the ancient seats of practicing metal-art [1], and one such ancient metalcraft has been the *Bidri* handicraft [2]. The availability of metal mines, foundries, and dexterity with metallurgical knowledge was one of the primary reasons for metalcrafts to flourish in the country. This dexterity with metal encouraged craftsmen of the times to cater to the royalty by producing artefacts of aesthetic utility, like the *huqqas* (hubble-bubble), ornament boxes, pitchers, figurines, and other articles [3]. India is attributed to be the birthplace of zinc metal dating back to the 5th century BCE, supported by the excavations found in Lothal and Atranjikhhera, in the Indian states of Gujarat and Uttar Pradesh [4, 5]. Another narrative that supports this claim is the presence of mining ores in Rajasthan, right from the Bronze age, i.e., from the mid-fourth millennium BCE [6, 7]. Further, as bronze is a copper alloy with zinc (and tin), it is obvious that zinc ores must have been prevalent before the bronze age.

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Impact of variable pH on the stability and aggregate kinetics of Bidri handicraft surface patina

December 2022 · Inorganic Chemistry Communications

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Widespread use of zinc and copper for their anti-corrosive properties with their appearance and reactivity also usage of silver in a variety of scientific and consumer applications intensifies the need to document their stability in varied aqueous environments. Thus the current work records a series of experiments with variable pH (buffered), to determine the surface stability and robustness of ... [\[Show full abstract\]](#)

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Development of highly efficient oxygen evolution reaction (OER) electrocatalysts is a critical challenge in the cost-effective generation of clean fuels. Here, a metal-free tyramine functionalized graphene oxide (T-GO) electrocatalyst is proposed to use in alkaline electrolytes for enhanced OER. Moreover, the T-GO and GO nanomaterials are well characterized by SEM, XRD, FTIR, XPS and Raman ... [\[Show full abstract\]](#)

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Vijay sarjerao Sapner · Bhaskar Sathe

Herein, metal free tyramine functionalized graphene oxide (T-GO) electrocatalyst is used for the electrochemical determination of ascorbic acid (AA) and organic pollutants specially substituted phenolic compounds i.e. p-nitrophenol (p-NP) in 1 M phosphate buffer solution at pH-7 as a model species. Cyclic voltammetric investigation towards AA and p-NP is having significant role in biosensing and ... [\[Show full abstract\]](#)

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Herein, cerium/ceriumoxide nanoparticles have been decorated on reduced graphene oxide (Ce/CeO₂-rGO) for room temperature electrochemical determination of H₂S in 0.5 M KOH electrolyte. There is a superior linear correlation between the peak current density and H₂S content in the tested range of 1–5 ppm. Moreover, compare to other abundant gases shows no response such as CO₂ at the ... [\[Show full abstract\]](#)

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