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## Short Communication

# Analysis of beach rock samples of Andaman Island, India by spectroscopic techniques

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## ABSTRACT

Beach rock is a peculiar formation when compared to other types of rock formations. One such formation is found in Andaman and Nicobar Island of India. It needs intensive and extensive investigation on its formation. The present work aimed to collect the beach rock samples along the Coast of Andaman Island and subjected to mineral and multi-elemental analysis using spectroscopic techniques. The presence of mineral in beach rock samples is identified by FT-IR spectroscopic technique. The constituents of minerals present in the beach rocks are further confirmed by XRD technique. Elemental concentrations of beach rock samples have been analyzed using non-destructive technique of energy dispersive X-ray fluorescence (EDXRF) spectrometry. The concentrations of Al, Ca, K, Fe, Ti, Si, V, Co, Cu, Ba, Zn, Pb, Cd & Mn are determined. The geochemical behavior of elements in the region is discussed. The spectroscopic techniques reveal the cementing minerals and elemental compositions of beach rocks of Andaman Island, India. Results are discussed and the conclusions are drawn.

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## 1. Introduction

Beach rock formation is peculiar compared to other types of rock formations. It is a sedimentary formation commonly appearing as layered deposit inclined towards the sea. It is influenced by the effects of carbonate cement-aragonite or magnesium calcite initially formed in the inter-tidal zone. Like the beach itself, beach rock represents a transition between the marine and meteoric environments, where

processes from each environment commonly affect it. Beach rock also acts as a resistant barrier to erosion, thus affecting the shoreline's rate of erosion and overall development. However beach rock can be quite useful in describing and delineating environments of deposition [1]. Beach rock forms most commonly on beaches composed of calcareous shell and coral grains, but it can also develop in beaches of quartz sand or other mineral composition. It forms best on sand beaches; shingle or conglomeratic beach rock is less abundant. The

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natural factor of the beach, such as gentle slope of the foreshore, sufficient shell content and ground water temperature have also favored the formation of beach rocks. Essential to beach rock development is ground water with enough calcium to provide cementing effect.

Beach rock formation is found in many places in the world [2–12] and few places in India [13–15]. The beach rock samples of Tamilnadu were analyzed for cementating minerals and to study the elemental composition Instrumental Neutron Activation Analysis (INAA) and Particle Induced X-ray Emission (PIXE) techniques were used [16,17]. One such beach rock formation is found in the Andaman Island [13]. The Quaternary rocks of Andaman-Nicobar Archipelago are very significant as they have various types of sediments capable of unraveling the climatic history, sea level variations and neotectonic activity, shore sand, beach rock, raised beaches, corals and sediments associated with mangroves are the important constituents of the Holocene deposits. Of these entire beach rocks are very significant as they represent the former strandline and hence sea level variations. The beach rocks are common all along the coastal tract of Andaman-Nicobar Archipelago [13]. These islands are represented by an active sub-areal ridge located between the Arakan-Yoma in the north and Java-Sumatra in the south (Lat 6 45 N to 13 43 N; Long 92 15 E to 94 00 E). Geologically the Andaman basin is very interesting as they have a long sedimentary record ranging from Cretaceous to Recent. The basin is studied for its geology

and paleontology since a century and several valuable contributions have been made [18,19]. A detailed examination is required to understand the process of cementation of beach rocks of Andaman Island by studying the mineral and elemental composition using spectroscopic techniques.

The EDXRF technique is chosen for the present work due to its advantages like non-requirement of chemical treatment of the samples; it is less time consuming non-destructive method. It is a rapid multi-elemental technique. Many workers reported earlier the determination of elemental composition of various environmental matrices by EDXRF technique [20–26]. The objective of the work is to determine (i) minerals composition of beach rocks by FTIR spectroscopic study and it is confirmed by XRD technique (ii) the elemental composition of beach rocks by EDXRF (iii) comparison of elemental concentration with crustal average values.

## 2. Materials and methods

### 2.1. Sample collection and preparation

The samples were collected at three locations (Wandoor-B1-B2), (Neill Island- B3–B4), (Chidyatapu-B5-B8) using global positioning system (QueM5 with accuracy: up to 10 m). A detailed geological survey was carried out before the field-work. At these localities the samples were collected along the

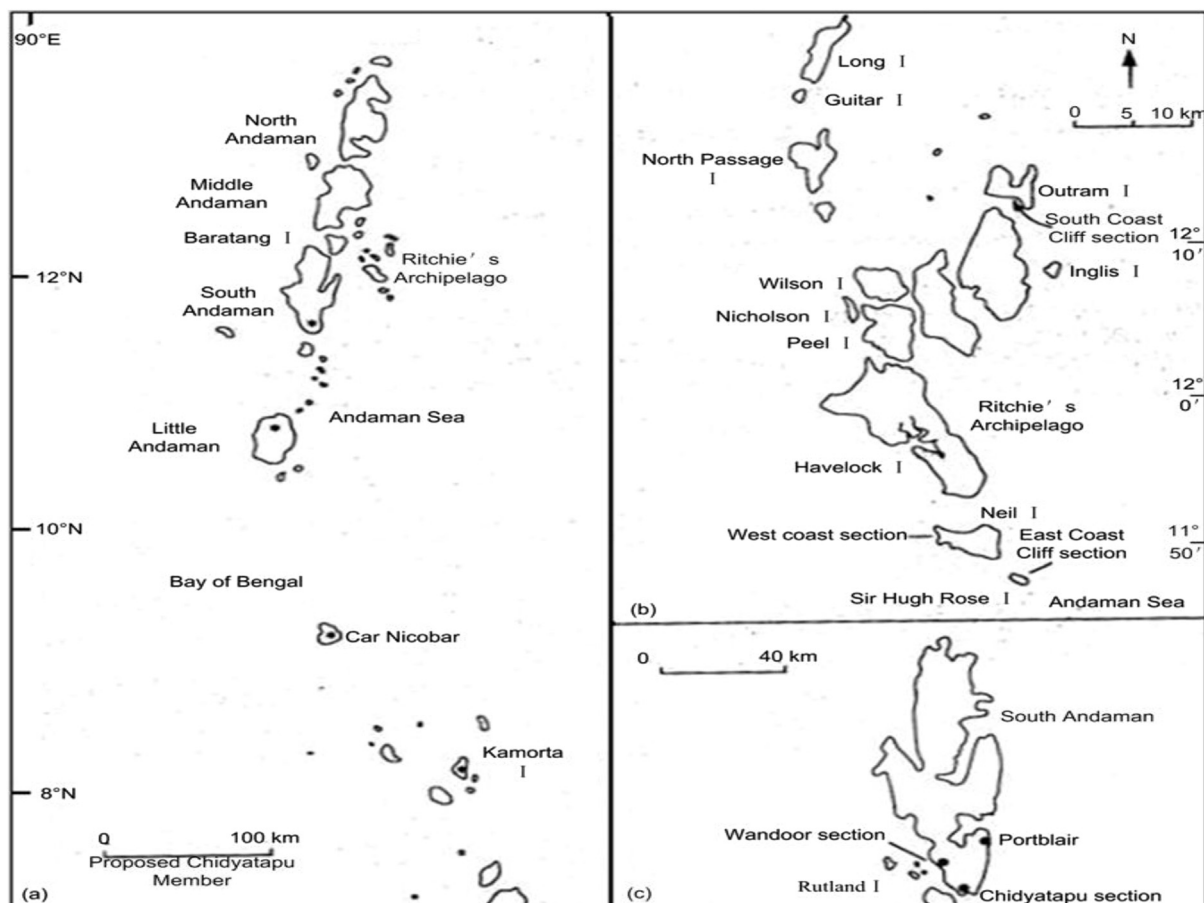


Fig. 1 – Location map.

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