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MICROSTYLOLITES IN LATE PRECAMBRIAN CARBONATE ROCKS, KARNATAKA, SOUTH INDIA

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Abstract

Microstylolites occurring in Carbonate rocks of Bhima Group (late Precambrian), Karnataka, South India, have been classified on their geometrical aspects, Their origin is attributed to a possible local disturbance during the early diagenetic period.

Introduction

Rocks of the Bhima group occur in an area of 5200 sq km in parts of Gulbarga and Bijapur Districts, Karnataka. The main lithological units of this group are the conglomeratic quartzites, sandstones, shales and carbonates. During the course of petrological studies of carbonate rocks, the authors have come across several types of microstylolites. These have been classified according to Park and Schot (1968) and described here.

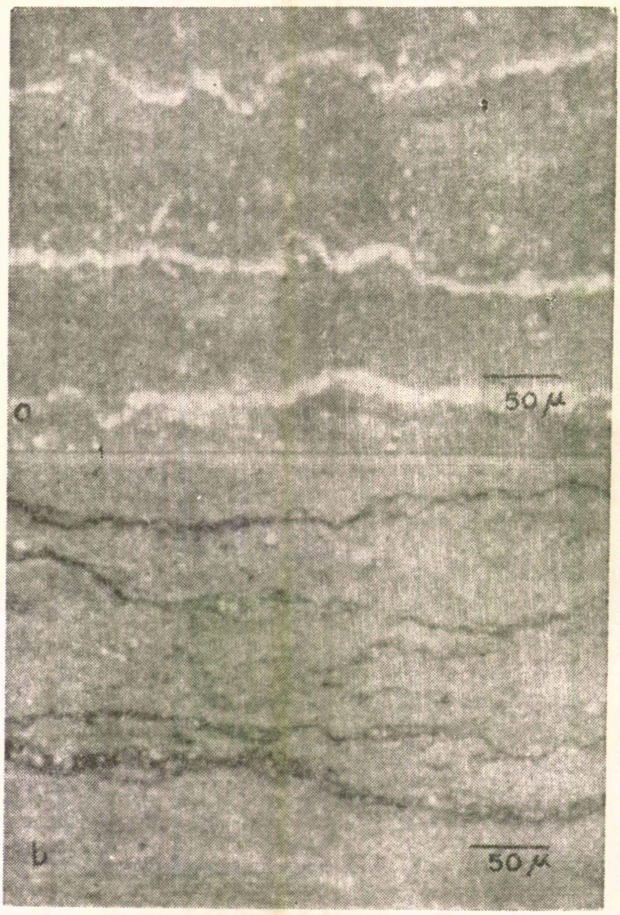

Figure 1. Geometrical classification of microstylolites. Simple wavy type: (a) Microstylolites are very smooth and parallel to the bedding—simple wavy parallel type. (b) Microstylolites are non-parallel and interconnecting with each other—Simple wavy non-parallel type.

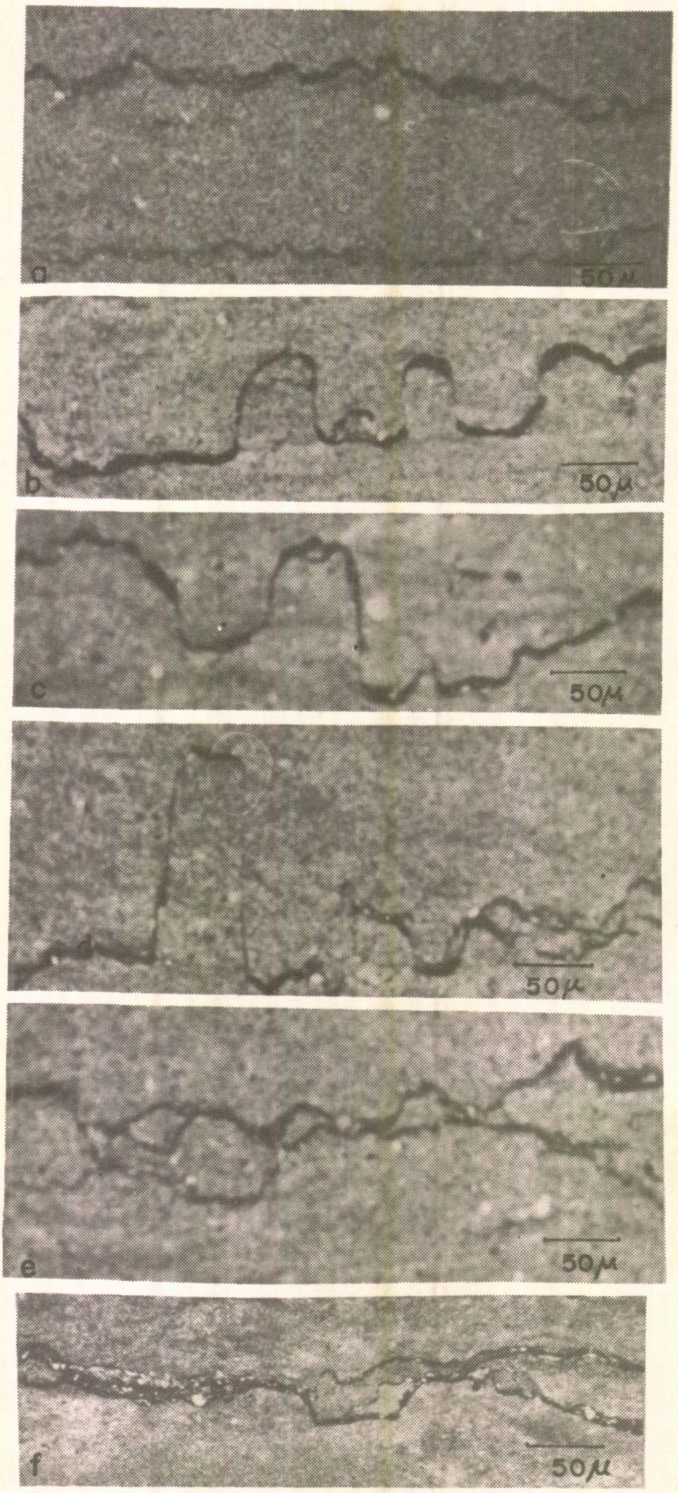

Figure 2. Geometrical classification of microstylolites; Suture type: (a) Microstylolite structure with simple suture projections on both sides – Simple suture type; (b), (c) and (d) Suture Structure is accompanied by ridge – Suture ridge type: (e) Suture type branching off at intervals and forming augen-like structure – Suture – branching – eyelet type; (f) Microstylolites initially interconnected, later branches off: Suture – Interconnecting- branching type.

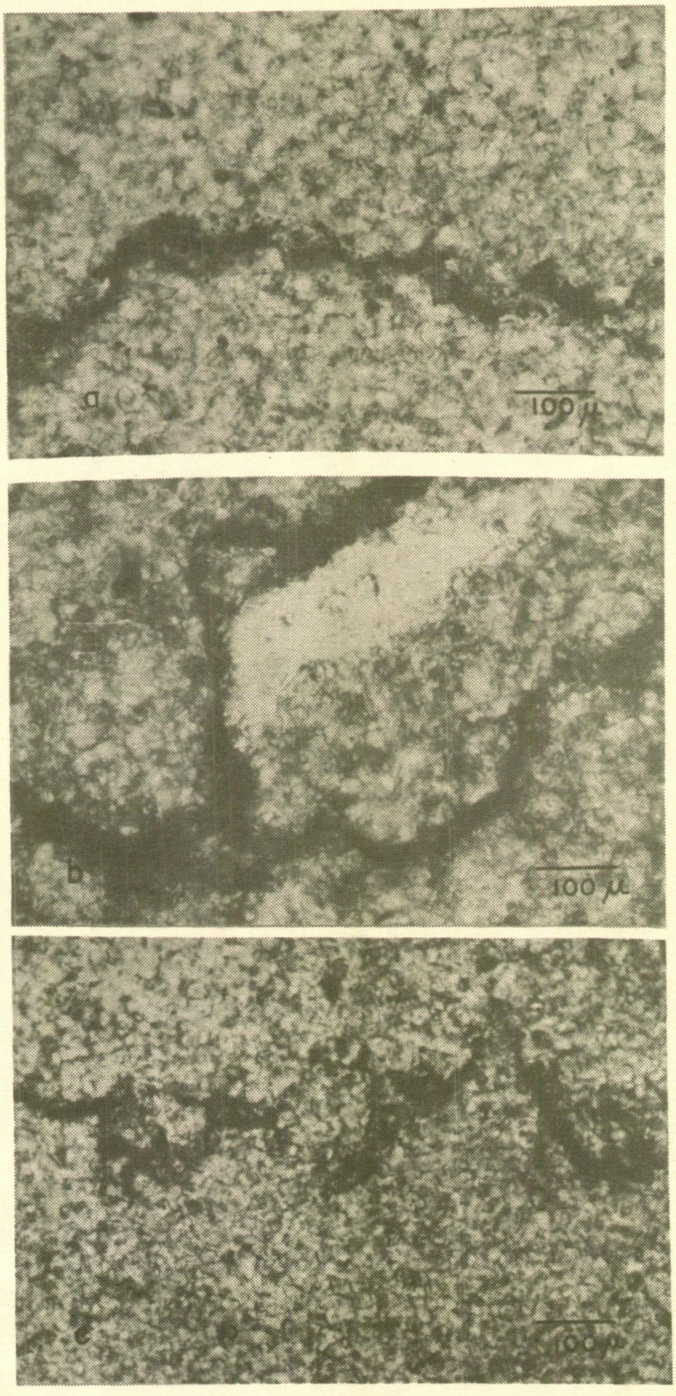

Fig. 3. Microstylolites and host rock relationship.

Classification of microstylolites

Microstylolites are developed parallel, inclined and vertical to rock bedding. These are classified based on the geometrical aspects and their attitude with respect to bedding. They are:

1. Simple wavy type
   - Simple wavy parallel type (Fig. 1a)
   - Simple wavy non-parallel type (Fig. 1b)
2. Suture type
   - Simple suture type (Fig. 2a)
   - Suture-ridge type (Figs. 2b, 2c and 2d)
   - Suture-branching type (Fig. 2e)
   - Suture interconnecting-branching type (Fig. 2f)

Intergranular stylolites are not observed in the Bhima carbonates. These limestones are very fine-grained and it is difficult to study the crystallographic orientation of grains, grain-size, shape, degree of contact and the interface energy per unit. The amplitude of stylolite is larger than the grain diameter.

Simple wavy type: This type has gentle undulations with small amplitude and more wave length; while the primitive wave-like type of Park and Schot (1968) exhibits prominent and deep undulations, resembling fold patterns. The clay residue in this type is patchy and distributed along the seam.

Suture type: The crest and trough of the microstylolitic structures have interlocking projections in both the blocks; the structure undulations are asymmetrically distributed. The development of this type is observed in fine-grained limestone having quartz and calcite. The suture junctions varies with their amplitude and length by differential pressure solution.

Microstylolites and host rock

The limestones in the central part of the basin are massive, compact, fine-grained and dense with grey, brownish, bluish-grey and black colours. The thinly bedded limestone are often argillaceous. Staining tests revealed that the carbonates of Bhima group include dolomite, dolomite + ferron calcite, dolomite + ankerite, dolomite + ferron calcite + ferron dolomite. The ferrous iron in the rock is capable of ionic substitution in calcite lattice and hence, rich in ferron calcite. The ankerites are intermediate in composition between dolomite and ferrodolomite. These two are present and have formed late in the sequence of cementation.

The host rock in which these microstylolites occur is a fine- to very fine-grained dolomite and/or limestone (Fig. 3). Accessory constituents include fine-grains of quartz, calcite and pyrite. It is early diagenetic. Quartz occurs in very small amounts in the form of anhedral to euhedral grains.

The microstylolite seams are a variety of suture type with or without residual matter (Fig. 3). The insoluble residue and/or clay matter has been noticed variously associated with stylolite seams. 25% of the microstylolites, however, do not show any evidence of associated clay material. In others, it is present as irregular, discontinuous patches confined to the crest and trough regions of the strucrures. Microfaulting and branching is also evident in many microstylolites. These faults, however, do not continue into the host rock above and below the seam. They are

probably the result of compaction or volume reduction phenomenon during stylolite formation.

Discussion

Based on thin section studies stylolitization is identified to be a diagenetic, pre-lithification phenomenon. Solution penetration could not, however, occur, if the interspaces had been filled up by calcite, before the rock was subjected to pressure. The pre-lithification origin of the stylolites is well-supported by the presence of a seam of residual, relatively insoluble material along the stylolitic surface, and by the presence of micro-step faulting and suture types of microstylolites.

Another important aspect of these microstylolites is that the laminae of residuals are not straight, but are composed of a chain of discontinuous curved sections of areas in a circle. This is suggestive of a shift in pressure and the consequent surface tensions along the stylolitic horizon. The processes of stylolitization or pressure solution phenomenon proceeded first by dissolving the carbonate material at one point, then at another and thus the process continued.

The various types of microstylolites of Bhima carbonates and clay on both sides of the stylolites, the development of horizontal, inclined and vertical types of structures points to the solution pressure theory and the presence of microstructural cleavages, bent laminae, cross-cutting relationship in the structures, faults and different types of joints are evidences of a possible influence of local disturbance even during the diagenetic process.

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Reference

PARK, W. C. and SCHOT, E. N. (1968) Stylolites: their nature and origin. Jour. Sed. Petrol., v. 38, no. 1, pp. 175-191.

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