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Review and prospect on the botryoidal structures from the Sinian Dengying Formation, Sichuan Basin, China

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ABSTRACT

Fabric of carbonate rock is the important foundation and one of main research contents for study on carbonate sedimentology, and has always been the attention of the academic circles. Botryoidal structures from the Sinian Dengying Formation in the Sichuan Basin is a kind of special carbonate fabric, the fabric is named after the shape of a grape. In this paper, from four aspects of the research status, the definition of the botryoidal structures and the related terms, the construction characteristics of the botryoidal structures, the component of the botryoidal structures, geochemical characteristics and the genesis of the botryoidal structures are reviewed. It points out the current research issues of botryoidal structures from the Sinian Dengying Formation in the Sichuan Basin, and put forward that future research should focus on the accurate analysis of its internal construction, precipitation mechanism of the major components, and the construction mechanism of botryoidal structures.

1. Introduction

Carbonate rocks are known for simple mineral composition, chemical composition and complex fabric [1]. The formation of carbonate rock fabric is often related to the specific environment and diagenetic mechanism [2–10], recording the information that the geochemical composition of the ancient fuild, ancient environment and ancient climate changes, and have important metallogenic significance. It is important foundation and one of main research contents for study on carbonate sedimentology, and has always been the academic attention. Botryoidal structures from the Sinian Dengying Formation in the Sichuan Basin is a kind of special structure of carbonate fabric, the fabric is named after the shape of the grape. Many domestic and overseas scholars have taken up research on the botryoidal structures, now, the research status of the botryoidal structures and its related research are summarized from four aspects, and analyzed the existing problems.

2. The definition of the botryoidal structures and the related terms

The botryoidal structures is named from shape and construction, some scholars describes it as botryoidal caries texture or Grapestone. Because the botryoidal caries texture is used by a part of domestic scholars, and Prehnite is a kind of silicate rock mineral name, which easily lead to conceptual confusion, so this paper uses the name of botryoidal structures.

The botryoidal structures was the first put forward by llling in the modern sea, which was found carbonate grain similar to the morphology of crystal structures of grapestone [11]. The sediment is circular, and all kinds of carbonate sand grain aggregate

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together to form composite grain and arises strongly micritization, they are cemented together by micritic aragonite. Later, such botryoidal structures was found in some cements and fillings, which consist of mineral deposits or mineral aggregate [12–18]. In order to describe characteristics of the section shape that are petal-shap, some scholars combine three dimensional form similar to grape and name it as botryoidal structures [19–21].

3. The output characteristics of botryoidal structures

The output characteristics of botryoidal structures mainly refers to the output state, scale and combination relation between the upper and lower rocks. It is one of the key factors to understand the forming environment, forming time, process and mechanism.

There are three types of botryoidal structures output state (Fig. 1), the first type is layer distribution and has the same distribution characteristics as the formation layer [21–26]; The second type is oblique bedding or layered filling formed along the holes or the wall of cracks [14,17,19,20,26–28]; Botryoidal structures in the vertical upward have multi cycle association relationship, and some special carbonate formations are often closely spaced in space, which mainly have vadose pisolite and ruiniform horizon [27], algae rich layer [18,21,23,30,31], oolitic combination [22,24,25] and tempestite. Recently, botryoidal structures was found in the ancient cold seepage system [32].

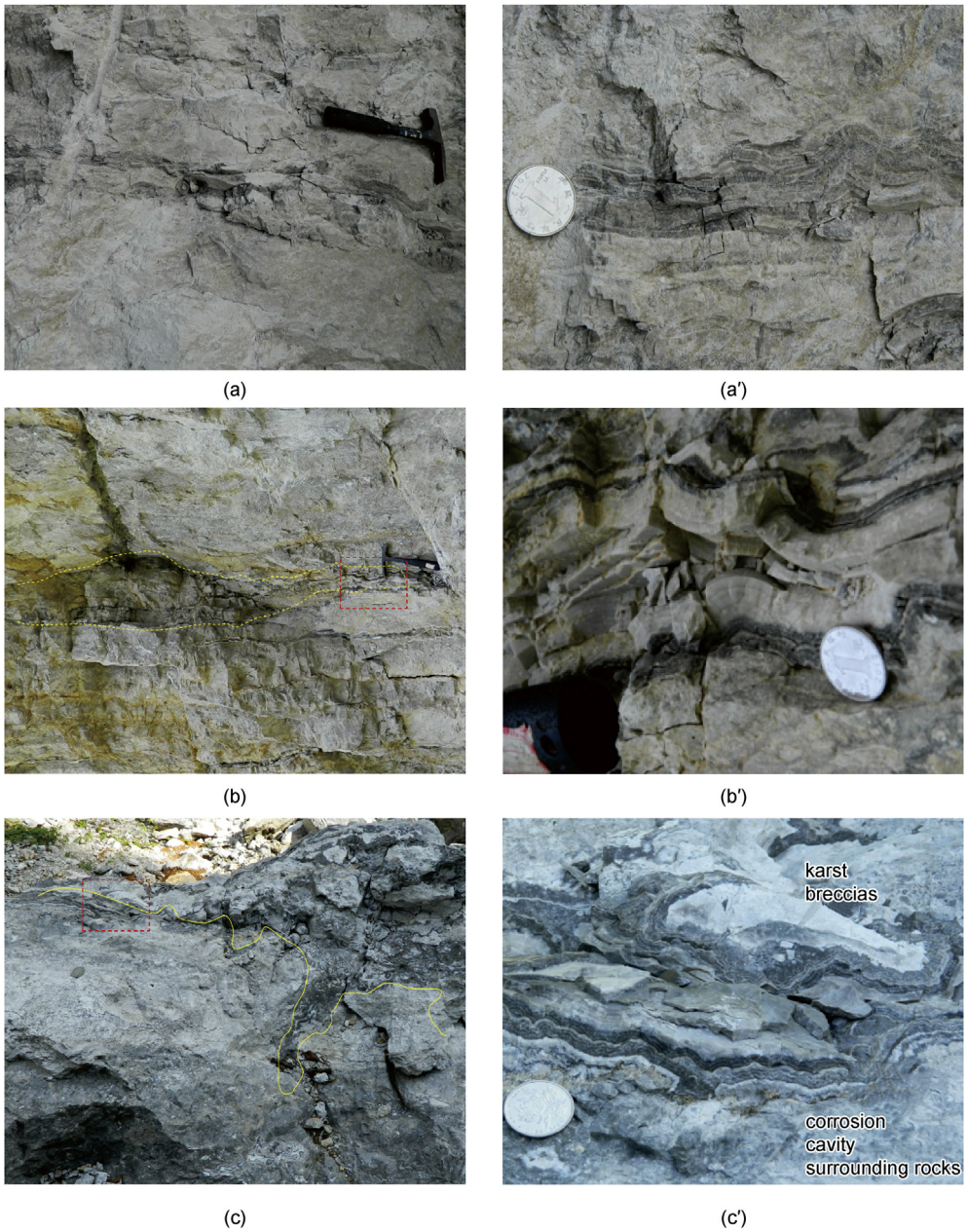

Fig. 1. The out statue of botryoidal structures from the Sinian Dengying Formation in the Sichuan Basin. A:strata grow up in one direction; B:botryoidal structures grow in opposite direction; C:in the structual corrosion fracture obliquing to bedding surface; (the yellow area is that the area of botryoidal structures development; the right is that the macrophotograph of the left).