一种新的牙形石分析方法

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自本世纪40年代以来，人们采用了酸类处理的方法来溶解碳酸盐岩类型的岩石，使得牙形石分析工作获得了很大的进步。世界古生界大量碳酸盐岩中的牙形石标本便是靠各种酸处理方法获得的。而处理的基本方式是将经过碎样的岩块（大约2公分左右）放入烧杯或塑料桶中浸泡，溶解。我们可以把这种方法称之为浸泡法。采用10%浓度的醋酸来浸泡、溶解碳酸盐岩以求获得牙形石化石的方法在美国古生物学家柯林森（C、Collinson）1963年的一本关于牙形石分析技术的专著中已给予明确的肯定（参见图1）并为全世界的古生物学家广泛采用至今。

本人在从事牙形石工作的过程中，常常感到“浸泡法”分析样品不仅需时较长，且所获得的牙形石标本破损较多。总希望能找到一种速度较快、化石完好率较高的分析方法。经过近年的探索和设计，终于完成了“塔式法”装置的实验工作，并取得了初步的分析成果。

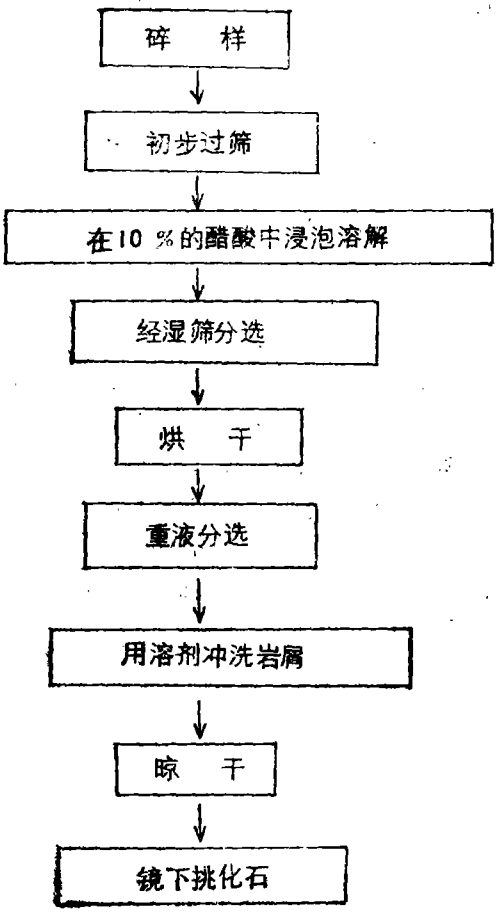

图1碳酸盐岩的实验室分析程序（参照c.collinson,1963）

“塔式法”的总体流程如图2所示，新鲜的10%的醋酸溶液置于容器A中，经过管线可由塔的下方进入塔内。流入时可经由四个与塔体相切交的管道。塔体的中部应安装一多孔的横隔板，板上置一孔径为0,1毫米的尼龙网筛。碎好的岩块置于网筛之上 。当醋酸溶液升高到塔体的上部，它可以自然地由另外四个与塔体相切交的管道流出而进入容器B。下方的四个管道以顺时针方向旋转排列，而上方四个管道为反时针方向排列。容器B中的醋酸可由泵压回容器A中 。流量以每小时10升为好 。如在中央上部加进一搅拌器则更利于加快反应的进行。当岩块全部溶解后，塔体内的醋酸可由通道K_1流入容器C 。塔体的上部有一圆形的门洞，有一门盖将此门洞紧紧封住。门盖上有螺旋可与塔体紧紧相联。当醋酸流出塔体后，可将门盖旋下 ，通过门洞而将尼龙网筛连同其上的岩屑轻轻取出并放入0.1毫米的金属筛中于水中清洗。经过清洗的岩屑，显然除去较大者，余者晾干或经重液处理或直接进行挑样。

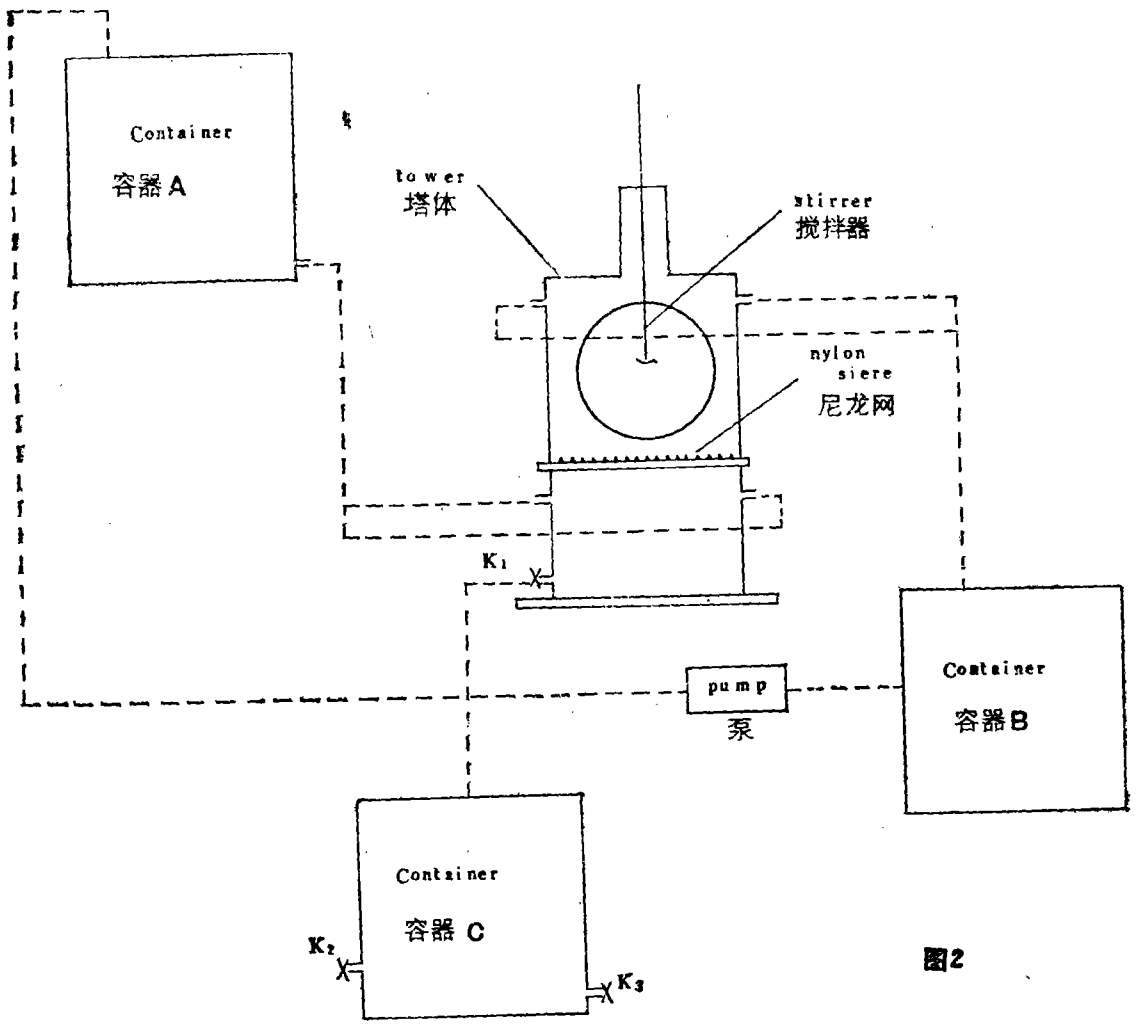

图2

我曾将华北北部所采的 上寒武统凤山组中的一块岩样（1000克）分为两部（各500克）分别用“塔式法”及“浸泡法”进行处理，所得的分析结果见表1所示。

表1 塔式法、浸泡法分析牙形石所得结果的对照表

序号	岩样编号	样品重量	方 法	质量及数量			
				好	中等	差	总计
1	ϵ_3f—9	500克	浸泡法	5	75	28	108
2	ϵ_3f—9	500克	塔式法	40	129	28	257

工作中曾先后得到我院陈世廉付教授、王贤新讲师以及英国诺丁汉大学R.J. Aldridge付教授的帮助。杨少春同志参加了全部分析工作。在此一并致谢。

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Collinson, C 1963, Collection and preparation of conodonts through mass production techniques. *Illinois State Geological Survey* Circular 343, 16 pp, 6 figs.

THE TOWER METHOD: AN IMPROVED METHOD FOR CONODONT RECOVERY FROM CALCAREOUS ROCKS

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Abstract

For several decades, acetic acid or other organic acids have been used to dissolve limestones and other calcareous rocks for the recovery of conodont elements and other microfossils. The standard laboratory procedure has involved immersing the rock samples in 10 per cent acetic acid in buckets or beakers, followed by wet sieving and heavy liquid and/or magnetic concentration (Collinson, 1963). A flow diagram based on that published by Collinson is shown in Fig. 1.

In my experience conodont elements retrieved from the buckets are commonly broken, and the speed of the disaggregation of the rock is rather slow. In order to increase the rate of the reaction and to minimize damage to the specimens, I have designed and constructed a tower apparatus (Fig.2). The principle is to circulate the acid over the sample and to protect the freed specimens from damage that may be caused as contact with undissolved rock.

Fresh acid solution is placed in container A and is allowed to flow through a tube into the lower part of the tower. Within the tower is a nylon sieve(150 mesh or finer) on which the sample, crushed to fragments of about 1 cm, is supported. As the tower fills, With the acid soeurion,the soeution acid flows out of the top through tubes to container B from which it can be pumped back into container A for recycling through the apparatus. A flow rate of about ten litres per hour is sufficient,and the reaction can be further enhanced by the insertion of a stirrer into the upper part of the tower. When the sample has been dissolved,the acid Can be removed from the tower through a tap (K1) into containcr C. A circular door with a lid in the upper part of the tower allows removal of the nylon sieve, and the residue can be washed gently with water before concentration and examination.

As an example of the relative efficiency of this method, I have processed two 500g splits of the same sample (Cm_3f-9) by the traditional 'soak' method and by using the tower apparatus. Cold acetic acid was used in both tests and the results are shown in Fig. 3. The soaked sample was only partly dissolved in five days and very few good quality specimens were recovered. In contrast, the sample in the tower was dissolved in two days and eight times as many well-preserved elements were found.

With my apparatus, 0.5-1kg samples may be used, but a larger tower cou'd cope with larger amounts of rock. The thickness of the rock layer on the sieve should not exceed 3cm. The procedure may be expanded for mass production by the employment of a series of towers. through which the flow could be generated by a single pump.

This work is only preliminary. According to an old Chinese saying "you must throw out a brick in order to bring forth a jade",my work is only a brick - I hope it will enable all conodont workers to gather more jades in the future.

Acknowledgements I thank Prof. R.J. Aldridge et al. of the Geological Department(Nottingham University) for their critical comments on this paper and a lot of useful help.