International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG (USA) Volume 7, Issue 12 -2020

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.12.019

# SEM and TEM Characterization of Siddha formulation *Sangu parpam*

**Rajamaheswari K[*1], Visweswaran S[1], Kabilan N[2], Meenakumari R[1]**

[1]National Institute of Siddha, Tambaram Sanatorium, Chennai, Tamilnadu, India.
[2]The Tamilnadu Dr. MGR Medical University, Guindy, Chennai, Tamilnadu, India.

***Corresponding author:** Dr.K.Rajamaheswari MD(S),
Ph.D Scholar, Department of *Gunapadam*, National Institute of Siddha,
Tambaram Sanatorium, Chennai – 47.
E-mail: *rajamaheswari.maheswari3@gmail.com*

## Abstract

Nano Medicines are wondering the medical world nowadays to treat challenging diseases such as CVD, all kinds of Cancers, Tuberculosis etc., Higher order medicines such as *Chenduram, Parpam, Kattu, Chunnam* kind of medicines in Siddha system are mostly possess the properties as Nano Medicines. *Sangu parpam* is a traditional Siddha drug used to treat various kinds of diseases including myocardial infarction. This particular *Sangu Parpam* which was prepared using the juice of *Phyllathus amarus* was documented for its structural identification through SEM ad TEM analysis. The results of SEM ad TEM images clearly indicates that the particles present in this Siddha formulation are in around Nano range. The aggregated particles were seen mostly as spherical in shape. The study results confirms that this formulation *Sangu Parpam* can be considered as Nano Medicine. So the bioavailability of this medicine will be great in treating various kinds of chronic diseases.

**Keywords:** Herbal, *Sangu*, Siddha, *Parpam*, SEM, TEM

## 1. Introduction

Siddha medical science is a wonderful kind of streamin treating challenging diseases with great therapeutic properties. *Sangu parpam* is a unique formulation which was indicated to treat Cardiovascular diseases. CVDs are the highly prevalenced disease nowadays with highest rate of mortality recorded globally. The herbal which was incorporated in preparing this particular *sangu parpam* formulation was*Phyllanthus amarus*which is also already documented for its Cardioprotective effects.

Using modern analytical equipments this Siddha formulation need to be documented in various dimensions. SEM and TEM analysis was carried out to identify the structural nature of the drug. Based on the structural elucidation we can clearly understand the therapeutic effect of the drug. If the Cardioprotective potential of this drug was identified it will be highly beneficial to the society. The nano medicine nature of this Siddha formulation was confirmed using SEM ad TEM analysis.

## 2. Materials and Methods

### 2. a Drug preparation

The Siddha formulation *Sangu parpam* was prepared as per classical Siddha text[1].

### 2. b Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM/EDX) [2,3]

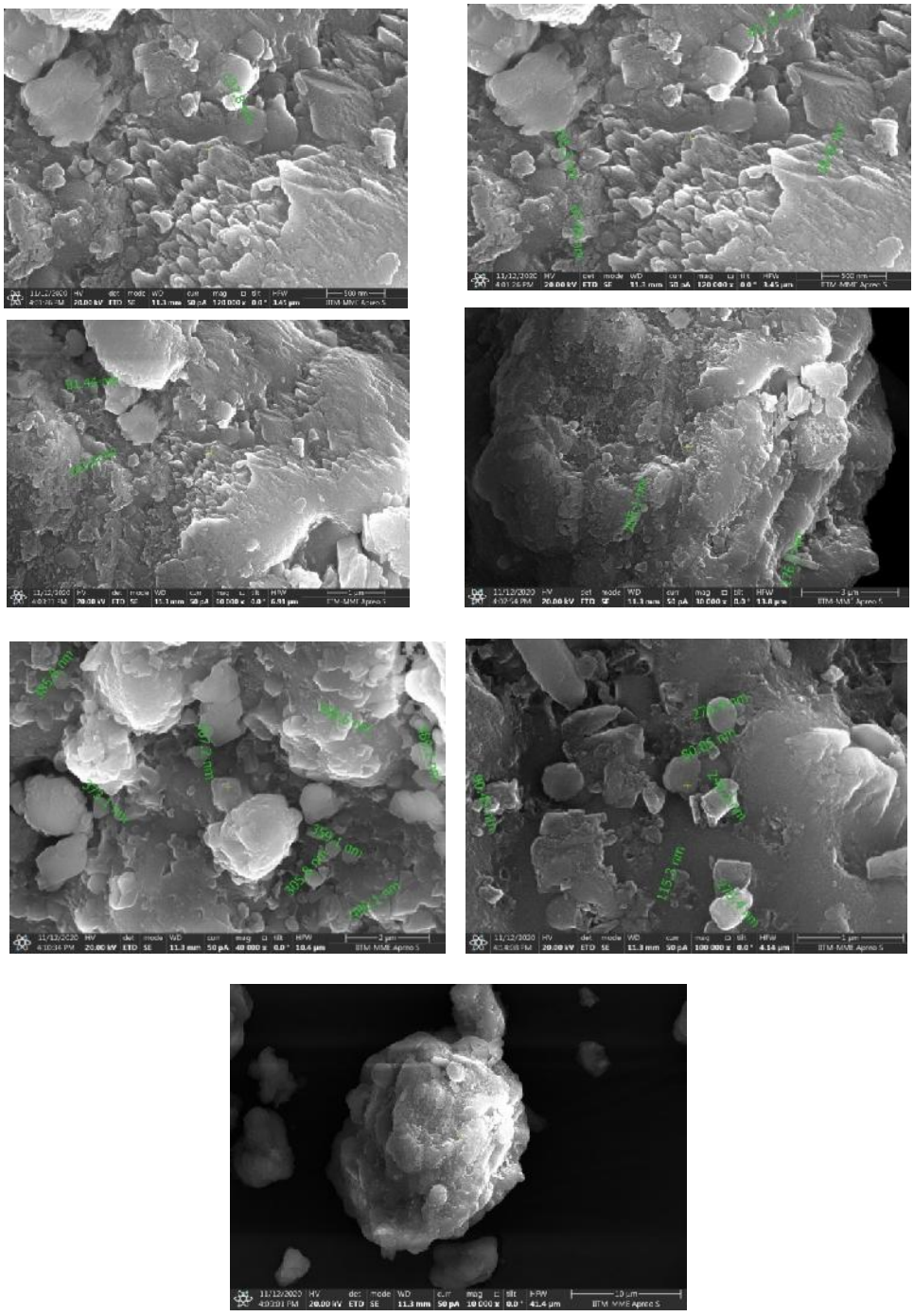
Undefined Scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDX) is the best identified and most widely-used of the surface analytical techniques. High resolution images of surface topography, with excellent depth of field, are formed using a highly-focused, scanning (primary) electron beam. The primary electrons pierce a surface with an energy of 0.5 – 30 kV and produce many low energy secondary electrons. The intensity of these secondary electrons is mainly governed by the surface topography of the sample. An image of the sample surface can thus be constructed by measuring secondary electron intensity as a function of the position of the scanning primary electron beam. High spatial resolution is possible because the primary electron beam can be determined to a very small spot (< 5 nm) is achieved when using a primary electron beam with an energy of < 1 kV. The SEM analysis was carried out in metallurgy department, IIT madras.

### 2. c Transmission Electron Microscopy [4].

TEM specimen stage designs include airlocks to allow for insertion of the specimen holder into the vacuum with minimal increase in pressure in other areas of the microscope. The specimen holders are adapted to hold a standard size of grid upon which the sample is placed or a standard size of self-supporting specimen. Standard TEM grid sizes are a 3.05 mm diameter ring, with a thickness and mesh size ranging from a few to 100 µm. The sample is placed onto the inner meshed area having diameter of approximately 2.5 mm. usual grid materials are copper, molybdenum, gold or platinum. This grid is placed into the sample holder, which is paired with the specimen stage. A wide variety of designs of stages and holders exist, depending upon the type of experiment being performed. In addition to 3.05 mm grids, 2.3 mm grids are sometimes, if rarely, used. These grids were particularly used in the mineral sciences where a large degree of tilt can be required and where specimen material may be extremely rare. Electron transparent specimens have a thickness around 100 nm, but this value depends on the accelerating voltage. The as prepared sample is mixed with ethanol and ultrasonicated further for dispersion of herbo medicine SP in the solvent. Few droplets of the solution is dispersed in the grid and it inserted into the TEM vaccum chamber to record the images. Magnification of the sample is a crucial technique to manage the sample for analysis. The TEM analysis was performed in IIT Madras.

# 3. Results and Discussion

## 3.a Analysis using Scanning Electron Microscope WITH EDAX

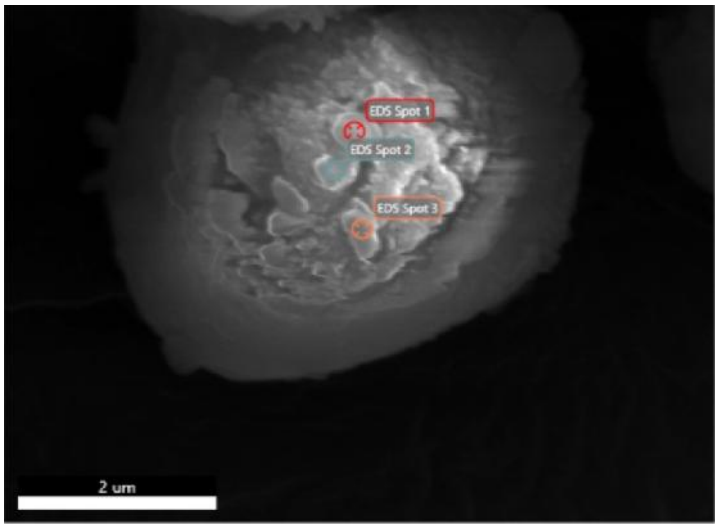


**SEM Images of *Sangu parpam***

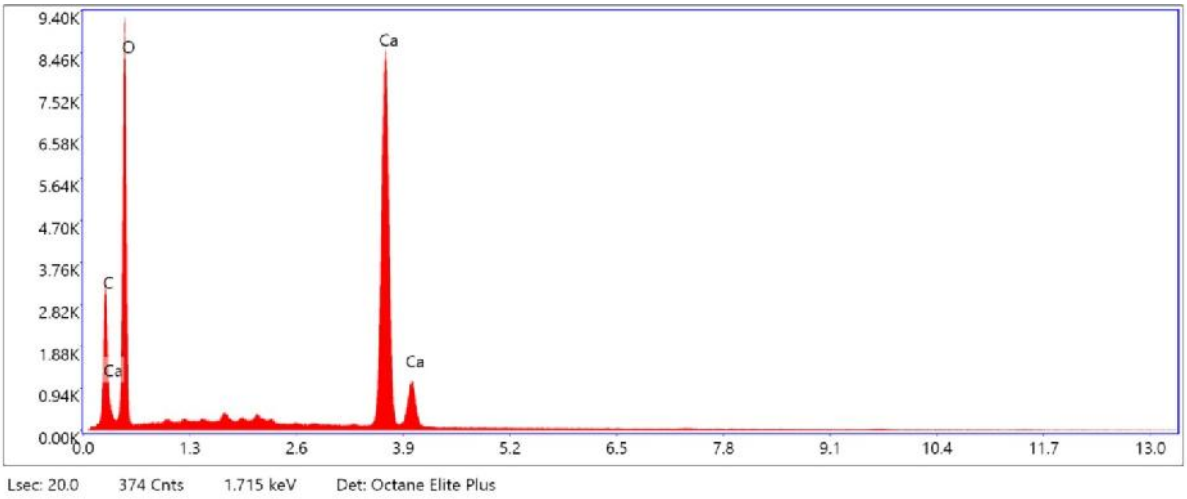
The particles present in Siddha formulation *Sangu parpam* was observed and around nano range. Particles were seen as aggregate and spherical in shape. The particles of Siddha formulation *Sangu Parpam*were seeninnano size are 80.85 m, 115.3 m, 90.45m.

## EDAX

## Area 1




## EDS Spot 1 - Det 1

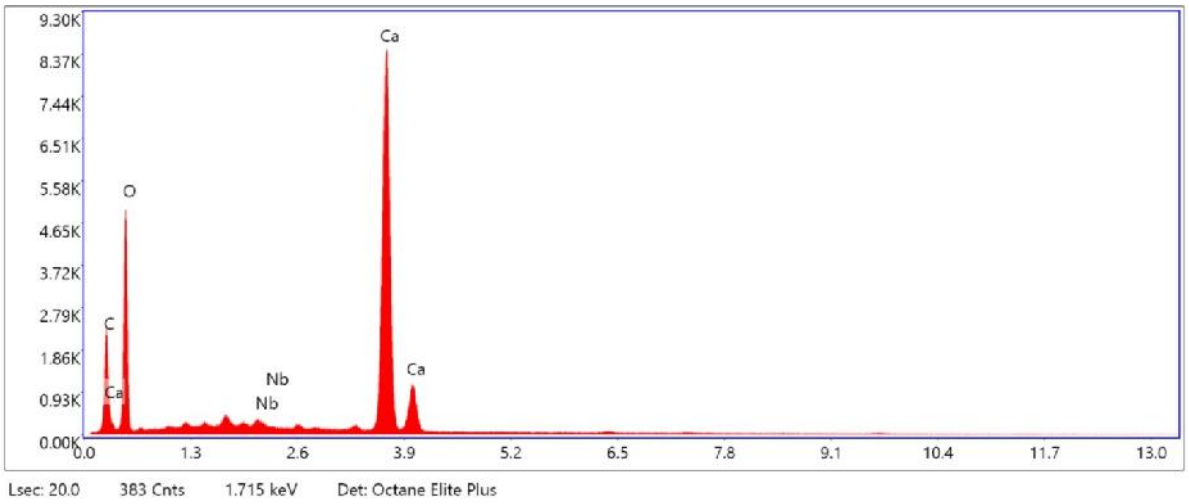



## eZAF Smart Quant Results

| Element | Weight % | Atomic % | Z | A | F |
|---|---|---|---|---|---|
| C K | 8.0 | 12.8 | 1.0844 | 0.4607 | 1.0000 |
| O K | 59.3 | 71.5 | 1.0391 | 0.1703 | 1.0000 |
| CaK | 32.7 | 15.7 | 0.8944 | 1.0103 | 1.0046 |

## eZAF Smart Quant Results

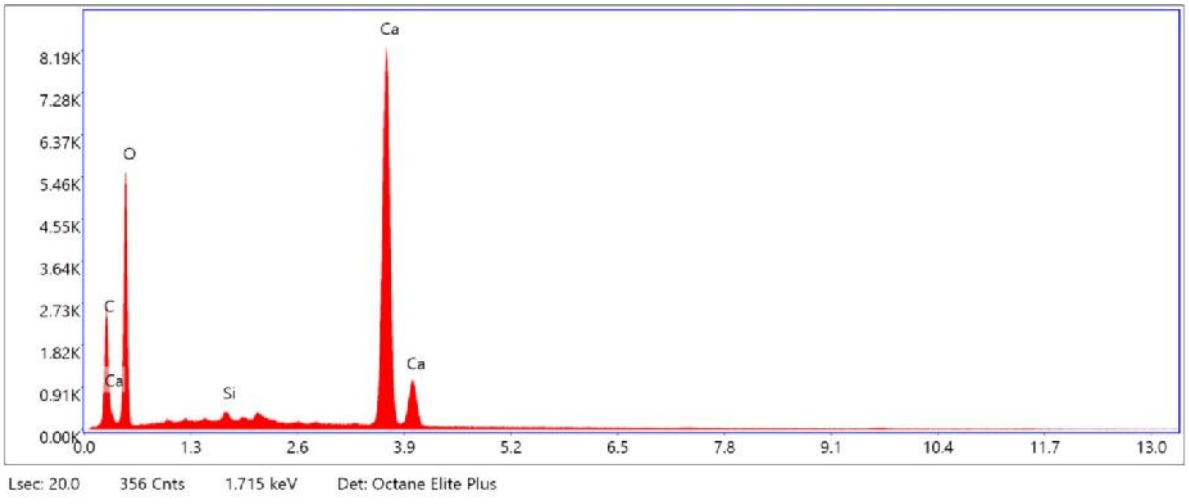
### EDS Spot 2 - Det 1




### eZAF Smart Quant Results

| Element | Weight % | Atomic % | Z | A | F |
|---|---|---|---|---|---|
| C K | 7.6 | 13.3 | 1.1013 | 0.4400 | 1.0000 |
| O K | 49.5 | 64.8 | 1.0561 | 0.1370 | 1.0000 |
| NbL | 1.5 | 0.3 | 0.7454 | 1.0751 | 1.0156 |
| CaK | 41.3 | 21.6 | 0.9110 | 1.0024 | 1.0032 |

### EDS Spot 3 - Det 1

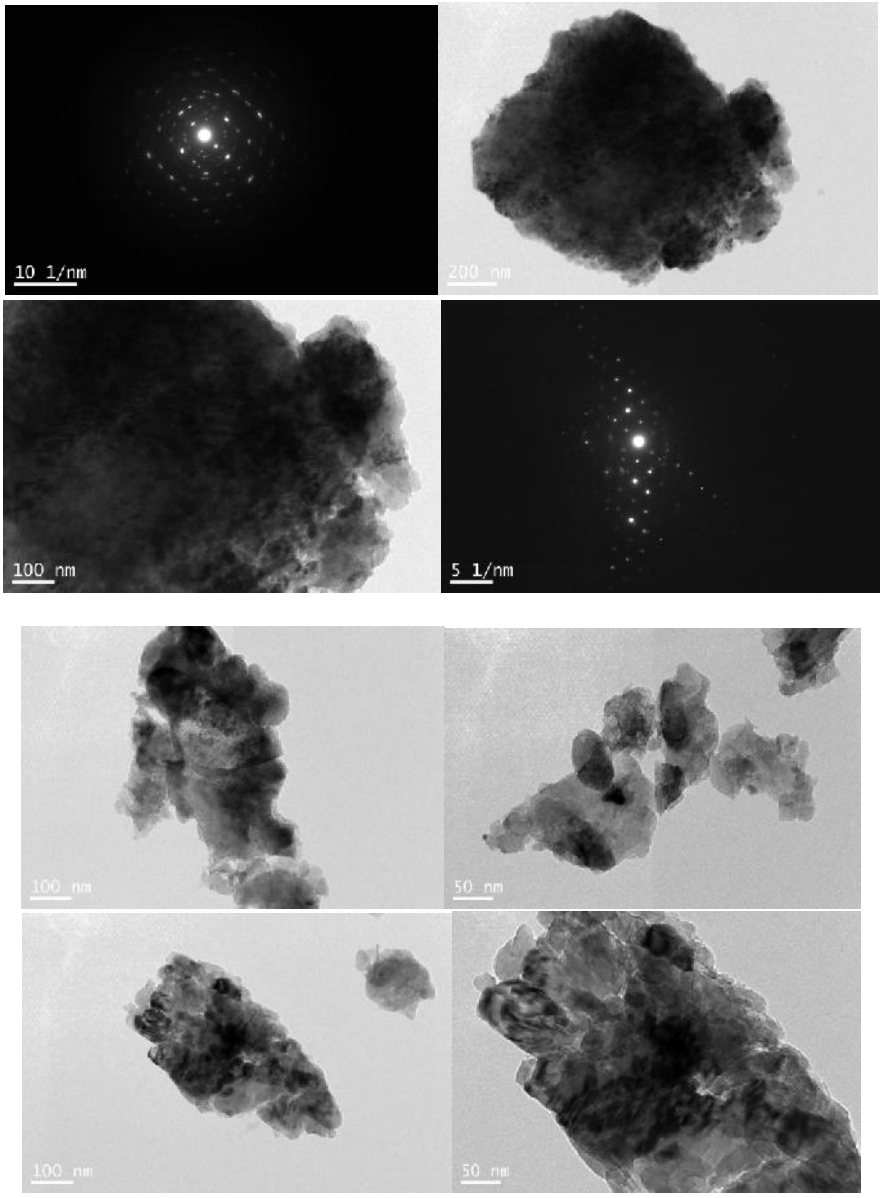


**eZAF Smart Quant Results**

| Element | Weight % | Atomic % | Z | A | F |
|---|---|---|---|---|---|
| C K | 8.3 | 14.0 | 1.0942 | 0.4510 | 1.0000 |
| O K | 51.7 | 65.6 | 1.0490 | 0.1442 | 1.0000 |
| SiK | 0.6 | 0.5 | 0.9563 | 0.7447 | 1.0183 |
| CaK | 39.4 | 20.0 | 0.9040 | 1.0083 | 1.0035 |

From the report of EDAX the elements present in this formulation majorly are oxygen, calcium, silicon.

### 3.b Analysis using Transmission Electron Microscope




**TEM Images of *Sangu parpam***

The Presence of nano size particles was confirmed which already seen through SEM. The results obtained from physiochemical evaluation of the study drug *Sangu Parpam* reveals that these drugs have a combination of nano and micro fine particles which particularly aids in drug absorption in the biological system.

## 4. Conclusion

In conclusion the results obtained from the SEM and TEM analysis of Siddha formulation *Sangu parpam* reveals the nature and size of the particles present in the drug. The nature of the ingredients attains structural modification during the preparatory phase then forms into the finished product. The particles which present in the finished drug *Sangu Parpam* are in and around Nano range. Hence we can conclude that this drug as nano medicine. It may have great bioavailability and shelf life. Hence in future this evidence based data could provide valuable standard for future researchers willing to pursue their research in *Sangu parpam*.

## 5. Acknowledgments

We wish to acknowledge our gratitude to The Vice Chancellor. The TN Dr. MGR Medical University, Guindy, Chennai, and IIT Madras for Instrumental analysis.

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| | Website: www.ijarbs.com |
| Quick Response Code | Subject: Siddha Medicine |
| DOI:10.22192/ijarbs.2020.07.12.019 | |

How to cite this article:
Rajamaheswari K, Visweswaran S, Kabilan N, Meenakumari R. (2020). SEM and TEM Characterization of Siddha formulation *Sangu parpam*. Int. J. Adv. Res. Biol. Sci. 7(12): 175-181.
DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.12.019