

HABIT OF METRO SURROUNDINGS AND ARCHITECTURAL SHAPING OF NATURAL CRYSTALS –A TECHNO BRIDGE BETWEEN CRYSTALLOGRAPHY AND CIVIL CONSTRUCTIONAL ENGINEERING

Dr. S Thiyagaraj^{1*}, Dr. Nagaiah Kambhala²

¹ Associate Professor, Department of Physics, Jain Deemed to be university, Bangalore

² Assistant Professor of Physics, Jain Deemed to be university, Bangalore

Abstract

A scientific platform between crystallography and architectural engineering, recovering number of issues related to the architectural challenge and protect a building from high vibration and dust stimulated from metro- environment. Issue has been controlling through architectural shaping of natural crystal and lattice environment of the minerals. Author addresses the issues on interrelationship between geomorphologic characteristics of the Karnataka in the context of the Metro region and the crystal structure which has also been fetched out from same region. The author is also addresses the combinational analysis of the architectural and space-planning design of the region.

Keywords: Crystal growth, Powder diffraction, Structural analysis, Rietveld refinement, Architectural planning

1 Introduction:

The crystal shape is determined by the environmental nature and concentration of the solute, as well as solvent parameters such as temperature, pH, ionic strength, viscosity, polarity, and so on. Depending on the structure of the molecules, the formation of crystal building blocks may begin immediately or may take months or years. Many organic-metallic chemists have failed to detect huge crystals at the bottom of flasks placed in the freezer after months of observation and assuming that no crystals would ever form. Fortuitous crystals can also form from unexpected sources. Some Russian researchers have demonstrated that nature's architecture design of the

*Corresponding author.

crystalline lattice of formed natural minerals and crystals. The results show that which was more adapted for that region and may have prevented the natural dissectors (1). This thought inspired the current study project. This research work has been finding the Metro-environment by collecting natural crystals at, southeast, and south west regions of Karnataka state and correspondingly investigating the architectural plan of that region and proposed plan of that region by crystal lattice to prevent all natural calamities. The advancement of scientific and technical progress creates a contradiction between a human's desire to conserve nature and exploit it. The urban environment is frequently unpleasant and, at times, hostile to humans. The search for a balance between natural and artificial components of the living environment and environmental preservation leads to "new trans-disciplinary" study topics, such as architectural geonics vs crystallography. It is a scientific area that solves modern engineering challenges by analyzing the structures and processes that occur in the inorganic universe. (2; 3; 4; 5). Architecture has always met the needs of rigidity, utility, and aesthetics (6; 7; 8; 9; 10). In seismically active places, the strength of architectural structures is a matter of life and death. But with respected to human curies mind setup searching the materials which are more stable forever and they are more adopted with inanimate nature and therefore they found the suitable materials is **inorganic, organic minerals etc.** Hence this research work is mainly focuses on finding crystals for controlling the local issues.

2 Methodology

2.1 Mineral resource in Karnataka

Researchers collected the samples form the Bangalore and begum regions, and the most common minerals are tabulated in table 1. It reveals that china clay and feldspar, silica are the common minerals in that regions. When we examine it we identified that, the Rocks that are rich in kaolinite are known as kaolin or china clay. Their structure of the minerals are examined by the Powder x-ray diffraction studies. It indicates that, that are all crystallizes in triclinic crystal system and the space group is P1, whose lattice parameters are indicated in the table2.

Similarly the structure of a feldspar crystal is based on aluminosilicate, which are crystallizes in tetrahedral. At the same time the fireclay refractories consist of three main phases, i.e. mullite and quartz are the crystalline components and glass is the amorphous portion. The amount of each phase is dependent on the Al_2O_3 , SiO_2 and flux content of the fireclay.

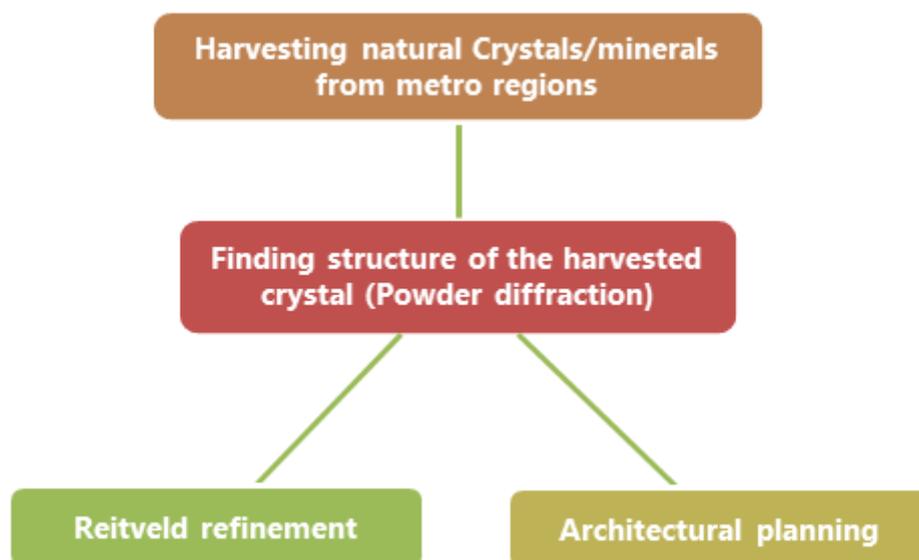


CHART 1

Methodology Harvesting natural Crystals

TABLE 1

Minerals found in Karnataka state

District	Minerals Found
Bangalore	China clay, Felspar, Fireclay, Quartz/Silica sand, Corundum, Granite
Belgaum	Bauxite, China Clay, Dolomite, Felspar, Limestone, Manganese, Quartz/Silica sand, Calcite, Fuller's earth

TABLE 2

Lattice parameters of the minerals in karnataka

Kaolinite	
Crystal system	Triclinic
Crystal class	Pedial (1) (same H-M symbol)
Space group	P1
Unit cell	$a = 5.13 \text{ \AA}$, $b = 8.89 \text{ \AA}$, $c = 7.25 \text{ \AA}$; $\alpha = 90^\circ$, $\beta = 104.5^\circ$, $\gamma = 89.8^\circ$; $Z = 2$

2.2 Theory of Complexity:

Assuming that architecture is a system that must consider complexity, the application of fractal geometry and the systems of crystallization in the production of complex structures and its forms (which the usual geometry is absolutely incapable of dealing with) can generate new methodologies, processes and design tools. The Theory of Complexity, which begins in the fields of knowledge of Physics and Biology, also expands to Mathematics through Fractal Geometry and this case study research work stated that the fractal theory is aligned with the worldview that permeates the production of contemporary science (11). In this theory there are two types of approaches they have followed, that is drawn in fig.1. There are two major platforms to develop the solution for the complexity. Such as Sierpinski Triangle, crystal formations. In this theory it reveals that The Sierpinski set is generated through a process of removing some of the initial figure and the Koch set is generated through a process of alteration of the initial figure.

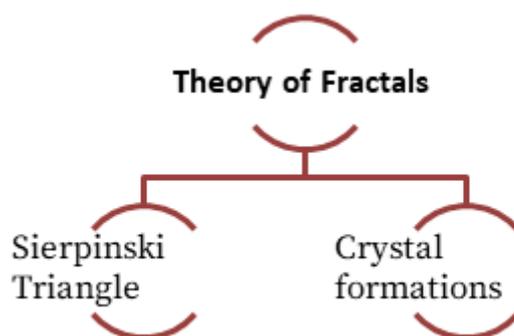


FIGURE 1
Fractals Theory

2.3 The crystal formation process

The crystals form are controlled by the structure and therefore the symmetry of the crystal can subdivide the crystals forms in three main groups: open groups cannot form a whole crystal by themselves need other forms to finish the crystal, closed group can form a whole crystal completely by themselves and Non-isometric Closed forms are generally forms the Disphenoid, scalahedron and trapezohedrons.

3 Processing method:

After these all theories, we developed test with a materials in Comsol multiphysics with simulation tool to predict the structure and thermal behavior. The graphical indication are listed in fig2.

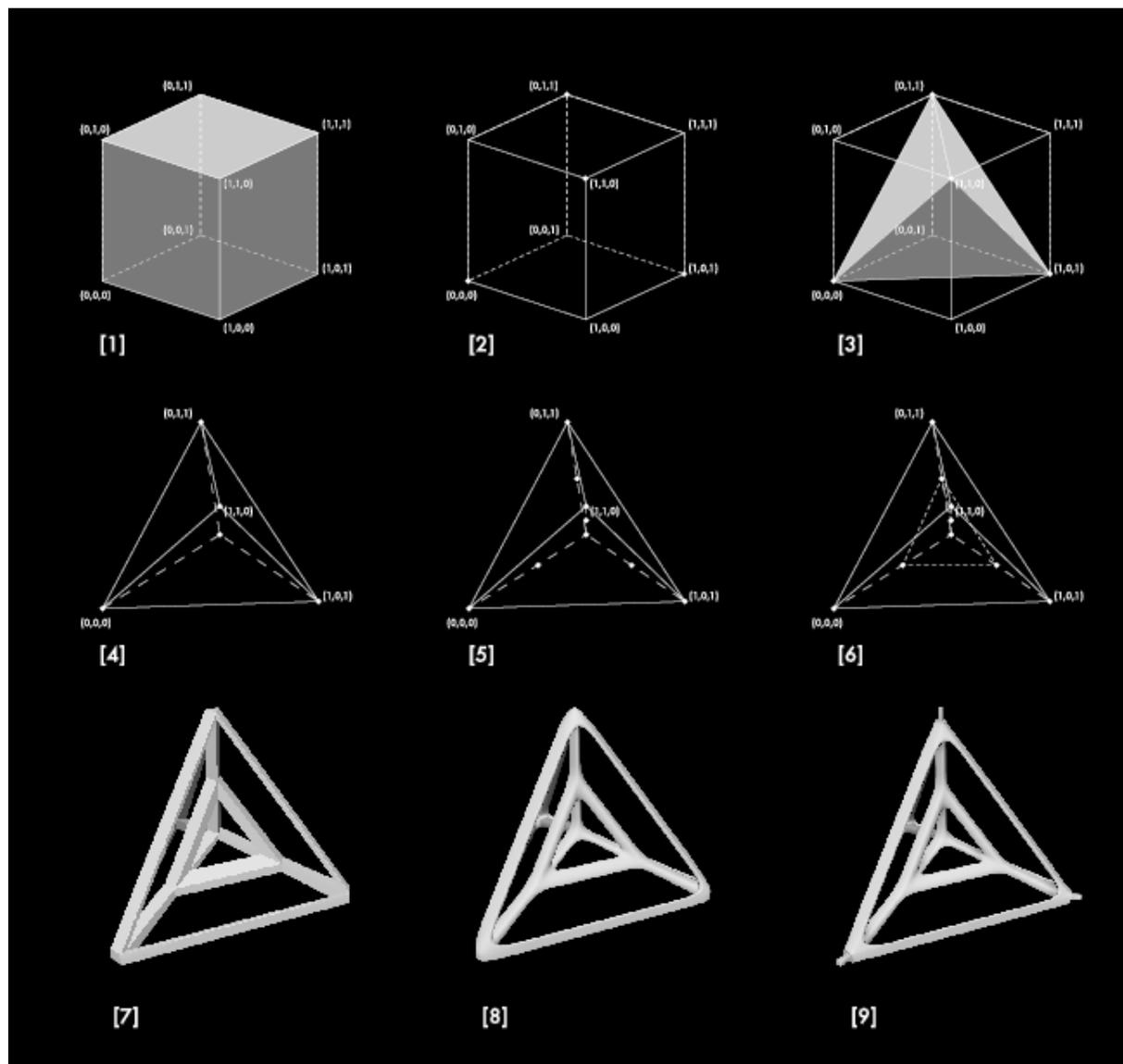


FIGURE 2

Comsol multiphysics output result about the structure of the crystals

The other advantages of using the **fractal theory** and parametric methodology is the possibility to use recursive process to develop a wide range of structures and form, using growth logics. In this particular case, we subdivide the growth logic in three groups: [3a] Connecting edges to edges; [3b] Connecting nodes to nodes and [3c] the combination of the two modes of connections at the same time.

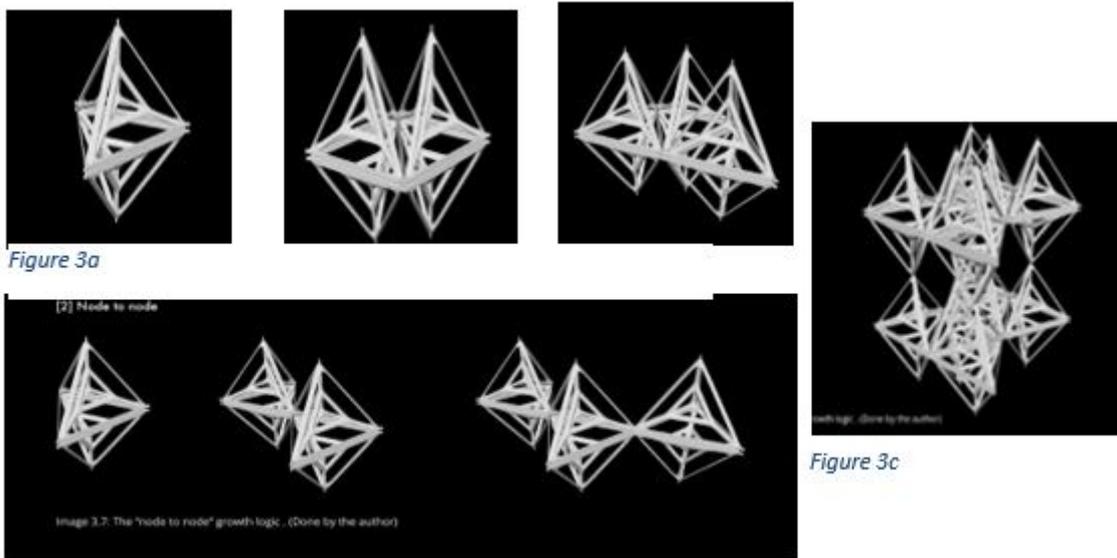


Figure 3b

Figure 3c

FIGURE 3
Growth logic in three groups

4 Conclusion

Problems in the civil / architecture business are not new; the same concerns reoccur and cover the common areas, architectural challenges, and protecting a structure from excessive vibration and dust driven by the metro-environment. The issue has been managing natural crystal and lattice environment of minerals by architectural sculpting, although this can be balanced by crystallography with architectural design. The Expected outcome of this research case study will help Public builders get awareness and restricted their future building proposals and they will follow the architectural shape of the crystal. Architectural nature of the crystal helps to withstand in natural disasters and calamities.

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