Ceramics are very useful materials in many areas due to their excellent properties such as heat and corrosion resistant. They have a poor property such as fragility as well as good features. Many researchers are trying to reduce the fragility of ceramics via using various methods defined as toughening mechanisms. The most common method is the improving fracture toughness of ceramics by adding fine particles. When examined ceramic raw materials, a mineral known as itacolumite give a different opportunity for obtaining flexible ceramics. Itacolumite is a species of sandstone rocks, which consists of large quartz grains and significant amount of muscovite in microstructure. Not only the large quartz grains but also the amount of muscovite in microstructure has an effect on the flexibility of itacolumite. Muscovite is the harden minerals upon drying or firing, so the amount of muscovite become more considerable for obtaining better improvements in the flexibility of itacolumite. Additionally, the microstructure of itacolumite contains micro cracks and interconnected pores along the grain boundaries. Because of these unique microstructure properties, itacolumite shows a flexible behavior without the any additives in comparison with the other sandstone rocks. For the production of itacolumite flexible ceramics, firstly the structure of itacolumite is going to be mimicked due to anisotropy of materials such as thermal expansion, and then gaining the flexible behavior to ceramic bodies due to micro cracking by thermal expansion anisotropy. Throughout the that study, firstly obtained micro cracking in micro structure of the body due to produced titanate compounds in the ceramic body’s structure, and then gained the flexible behavior to ceramic bodies due to that micro cracking was aimed. In parallel with this purpose, that study was performed as three main parts. At the first part, necessary compositions for obtaining the titanate compounds (Al₂TiO₅ and Al₂TiO₅-MgTi₂O₅) were designed according to phase diagrams of Al₂O₃ and MgO oxides with TiO₂. At the second part of the study, designed compositions were produced depend on some parameters such as firing time, firing temperature, heating and cooling rates. At the last part of the study, effect of changing in that four parameters on micro crack’s dimensions, density, pore size distribution, mechanical, thermal shock and expansion properties were investigated. Samples were characterized by using 3 points bending test, scanning electron microscope (SEM), x-rays diffractometer (XRD), dilatometer, Archimedes principle and mercury porosimeter. In this context, produced flexible ceramics by mimicking of microstructure of itacolumite are going to be useful for anti-vibrating systems and refractory industry due to high thermal shock resistance.