

# **Al-Co-Ni Based Decagonal Quasicrystal: A Study of Phase Transformation and Phase Stability by Synchrotron X-ray Diffraction**

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## **Abstract:**

Quasicrystals are intermediate materials between the crystalline and an amorphous, and neither follow the periodicity like any of them. However, quasicrystals retain the long-range order with lack of three-dimensional translational periodicity, named as quasiperiodicity. Even though the quasicrystals are thermodynamically stable phase, it is difficult to obtain their equilibrium in as-cast or solidified alloys. Various thermal annealing is required to get the stable phase with subsequent cooling at room temperature. Different types of alloys are investigated in the quasicrystal research. However, the Al-Co-Ni based alloys showed more interest in the decagonal quasicrystal regions. They have two-dimensional quasiperiodic planes. The studies in Al-Co-Ni based decagonal quasicrystal research is more interested due to the various composition of stable quasicrystal structures in Al rich region with different superstructures. The phase identification, quasicrystal and crystalline phase distribution, and quasicrystal approximation at 800° C are reported in the present report. In addition to that, the phase stability and phase transformation with composition and temperature are discussed based on synchrotron powder x-ray diffraction.