

## **Evidence by HRTEM of lower conductivity along the periodic direction than along the quasiperiodic direction of the decagonal quasi-crystalline phase of the Al<sub>62</sub> Cu<sub>20</sub> Co<sub>15</sub> Si<sub>3</sub> alloy.**

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The discovery of a stable decagonal QC phase in Al Cu Co by He et. al. [1] produced an important research on these phases in the system Al Cu Co (Si). Moreover, QC phases obtained in this system were also reported with special electrical properties [2-4]. It is important to note, that these QC systems show a strong variation of the conductivity with a very slight change in composition. In agreement with different authors, the electrical conductivity of the decagonal quasi-crystals of the Al Cu Co (Si) alloy shows metallic behavior along to periodic direction and nonmetallic behavior along to quasiperiodic direction.

In this work we show some HRTEM results that indicate a different behavior of the electrical conductivity for decagonal phase of the Al<sub>62</sub> Cu<sub>20</sub> Co<sub>15</sub> Si<sub>3</sub> alloy that was produced using a double elliptic mirror furnace with slow thermal inertial. We confirmed the decagonal structure of the Al Cu Co Si grains by a tilting series of selected area diffraction patterns, Fig. 1. We obtained, that the quality of their atomic resolution electron microscope images is modified drastically with the composition of the alloy. Therefore, we find that the HRTEM images from our alloy were almost impossible to obtain because the lack of electrical conductivity of the sample produced too much astigmatism. The best images obtained are present in figure 2. Compare these with those obtained by Reyes-Gasga et al. [5] in a sample with different composition. In that case, this kind of aberration was not present.

The sample was ground and supported in copper grids for their transmission electron microscope analysis. Electron diffraction patterns, tilting experiments were obtained using a JEOL 100CX analytical electron microscope equipped with  $\pm 60^\circ$  goniometer. Chemical analysis were carried out using a JEOL 2010F analytical electron microscope equipped with a  $\pm 22^\circ$  goniometer and a NORAN energy – dispersive X-ray analyzer For high resolution observation a JEOL 4000EX high resolution electron microscope was used.

### References

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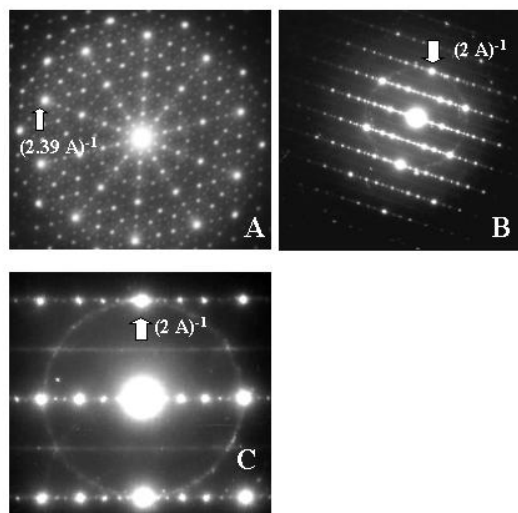


Fig. 1 EDP's of the decagonal Quasicrystalline phase. A) Along the 10-fold axis. B) – C) Along the two-fold axes, respectively.

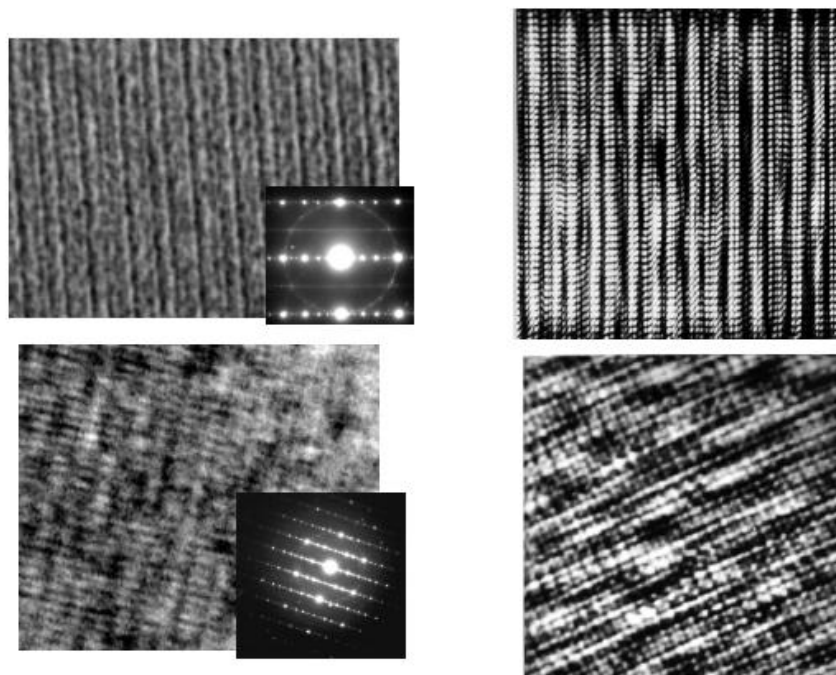


Fig. 2 Comparison between the high resolution images along the D and P axis, respectively, obtained from quasicrystals in this work and those obtained by J. Reyes-Gasga [6].

