Effect of Cr and Cu addition on the Al-Ni-Co QC phase formation

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Quasicrystals (QC´s) present an aperiodic, however, highly ordered atomic structure which leads to specific crystallographic symmetries such as, fivefold, eightfold, tenfold and twelvefold rotational symmetries. Over a 100 systems are known to form quasicrystalline phases and the associated approximants. These phases present interesting properties for protective coating applications as high hardness, low friction coefficient, high corrosion resistance in acid medium, high resistance to oxidation and low thermal conductivity. Corrosion resistance of QC phases are mainly dependent on the chemical composition of the alloy. In this sense, addition of corrosion resistant elements can enhance the corrosion properties of these materials. In the present work, the phase formation on alloys of the following systems was analysed: Al-Ni-Co, Al-Ni-Co-Cr and Al-Ni-Co-Cu. The alloys were fabricated by arc-melting and *melt-spinning* and were characterized by transmission and scanning electron microscopy (TEM and SEM) and by X ray diffraction (XRD). The arc-melted alloys were also submitted to an annealing heat treatment. The choice of the alloys composition was based on literature and on the Hume-Rothery rule adapted for quasicrystalline phases. The Al-Ni-Co decagonal phase, at least in the compositional range studied, did not show any solution of Cr within its structure. Another QC phase, Cr-rich, was formed in the rapid solidified Al-Ni-Co-Cr alloys. Addition of Cu increased the fraction of intermetallic crystalline phases such as Al_3Ni and Al_3Ni_2 at the expense of the decagonal phase.