# STRUCTURE EVOLUTION OF AMORPHOUS Ti-Zr-Ni FILMS CAUSED BY ANNEALING

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It has been established by recent studies that in the Ti-Zr-Ni ternary system the formation of a quasicrystalline icosahedral phase is possible under certain alloy compositions and fabrication modes. Due to their high heat resistance, high corrosion resistance and high ability to absorb hydrogen Ti-Zr-Ni quasicrystals are possible candidates for high-temperature protective coatings of nuclear reactor assemblies and rocket engine elements as well for hydrogen accumulators. In this paper we consider the possibilities of manufacturing quasicrystalline coatings by annealing amorphous films that were made by magnetron sputtering. Target composition was close to the optimum ratio of components (Ti – 40 at.%, Zr – 40 at.%, Ni – 20 at.%) in which the appearance of a quasicrystalline phase is observed. Structure characteristics of the films were investigated by X-ray diffraction. X-ray diffraction analysis of the samples with a thickness of several microns was carried out immediately after fabrication, as well as after a series of annealing in the temperature range of 100-600°C. It has been established that starting from ~ 350°C several distinct maxima appear on diffractograms. These maxima retain their positions with increasing annealing temperature. Fig.1 shows the diffraction patterns of the coatings in the initial (x-ray amorphous) state and after annealing at 550°C. The theoretical bar diffractogram was calculated for the model of the icosahedral quasicrystal [1] and it was compared with experimental curves (see Fig. 1). We consider that above-mentioned primary maxima relate to a phase with a quasicrystal structure, and annealing is a promising method for fixing a quasicrystalline state in Ti-Zr-Ni films.

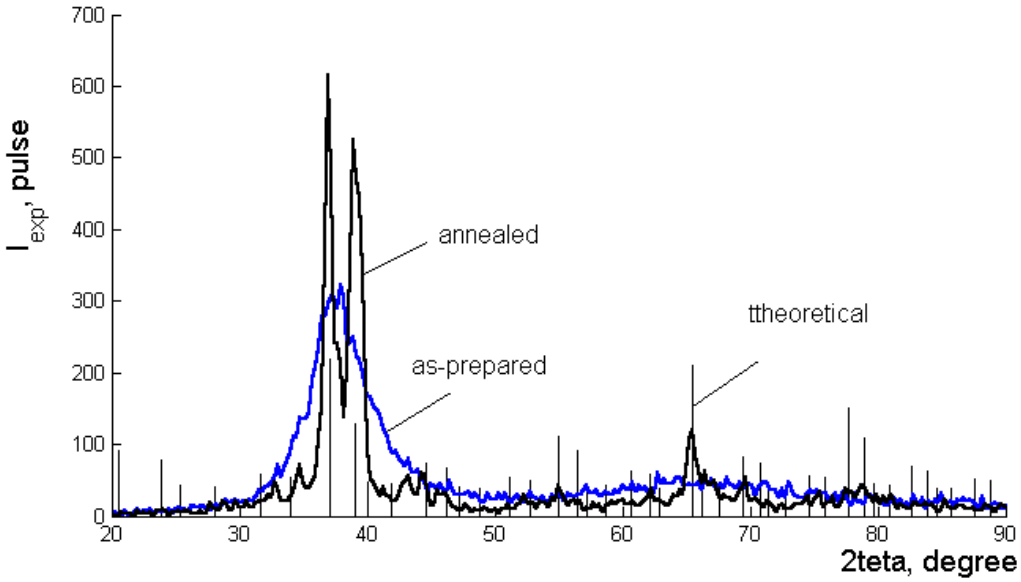


Fig.1 Diffractograms of Ti-Zr-Ni films

**References:**

[1] J.W.Cahn Indexing of icosahedral quasiperiodic crystals // J. Mater. Res.- 1986.- v.1, N1.- p.13-26.