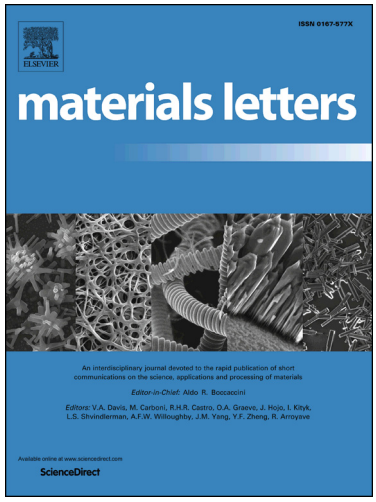

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Difference between local atomic structures of the amorphous Ti_2NiCu alloy prepared by melt quenching and severe plastic deformation

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Abstract: Specific features of the local atomic structure of the amorphous Ti_2NiCu alloy obtained by melt quenching (MQ) and severe plastic deformation by high pressure torsion (HPT) have been studied by X-ray diffraction, transmission electron microscopy, and EXAFS spectroscopy. It is shown that the amorphous phases obtained by MQ and HPT methods differ in local atomic structure. In the amorphous state obtained by HPT method, the local atomic structure depends on the degree of deformation.

Keywords: amorphous state; melt quenching; severe plastic deformation; high pressure torsion; phase transformation; amorphization

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1. Introduction

The most commonly used technique of obtaining amorphous state of metal alloys is the melt quenching (MQ) method [1]. However, there is an alternative amorphization method such as severe plastic deformation (SPD), which can be realized by high pressure torsion (HPT), accumulated rolling, and some other methods for deformation of crystalline alloys [2-4].

The natural question arises, whether or not there is a fundamental difference between the local atomic structures of amorphous alloys obtained by different methods (MQ and SPD). A correct answer to this question can be obtained if we analyze in detail the atomic structure of an amorphous alloy of the same chemical composition. This unique opportunity is provided by the Ti_2NiCu alloy, which can be obtained in the amorphous state using both by MQ [5] and HPT methods [6]. As a result of the described methods, only one amorphous phase was found in the Ti_2NiCu alloy, in contrast to the alloy investigated in [7]. In this paper, it was first attempted to establish possible difference in the local atomic structures of the amorphous Ti_2NiCu alloy obtained by various methods (MQ and SPD). To this