XIV Liquid and Amorphous Metals Conference

Rome 11 - 16 july 2010
"Sapienza" - University of Rome

Synopsis

The 14th International Conference on Liquid and Amorphous Metals (LAM XIV) will be held at the University of Roma "La Sapienza", Italy, July 11-16, 2010. The conference aims to gather the wide community of scientists interested in liquid and amorphous metals and to provide the attendees with an up-to-date survey of progress in this intriguing field of the condensed matter physics.

The first conference of this longstanding cycle of events was held in Brookhaven (USA) as LM-1 in 1966. The next liquid metals conferences were held in Tokyo (1972) and Bristol (1976). The cycle was then renewed including topics on amorphous metals in Grenoble (1980), Los Angeles (1983), Garmisch-Partenkirchen (1986), Kyoto (1989), Wien (1992), Chicago (1995), Dortmund (1998), Yokohama (2001), Metz (2004) and Ekaterinburg (2007).

As in previous editions, the conference is devoted to liquid and amorphous metals, and to those non-metallic systems which are traditionally hosted within the program (semi-conductors, molten salts, quasicrystals, etc.). We are planning also focused sessions to explore new horizons in the field of liquid and amorphous materials, with special emphasis on those which can be tackled with emerging techniques. These include the development of advanced radiation sources (synchrotrons, neutrons) for measurements of structural and dynamical properties of liquid, amorphous and colloidal phases; perspectives offered by novel fourth generation soft and hard x-ray sources for metals under extreme and/or highly metastable conditions; ultrafast techniques for studying phase transitions, chemical reactions and non-equilibrium states; ab-initio simulations of metals, alloys and nanosized systems.

The meeting will include single sessions of invited and selected contributing papers as well as dedicated poster sessions.

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On the viscosity of the Fe-Cr melts

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The investigations of the temperature and concentration dependences of the kinematic viscosity (v) of the Fe-Cr melts in the region up to 40at%Cr have been conducted by the method of damping torsional vibrations of the crucible filled with the melt. The alloys were prepared by the fusion of the prior prepared ligature, $Fe_{53}Cr_{47}$, and carbonyl iron at 1680°C for 30min followed by slow cooling.

The temperature dependences of viscosity of the Fe-Cr melts with the Cr concentration more than 4at.% have the complex non-monotone character at first heating. At further cooling a hysteresis of v has been observed lower than the characteristic temperature for each alloy. Simultaneously, the viscosity polytherms are described by the Arrhenius type monotone dependences and reproduced at the repeated heating after the samples crystallization. The nature of the obtained temperature dependences of viscosity indicates that the melts transform from non-equilibrium state to the equilibrium. It has been shown that the non-equilibrium state of the melts is caused by the slow redistribution of the components in the liquid phase in order to achieve local chemical ordering which is characteristic for each composition. It has been found that with the increase of the Cr concentration the onset temperature of the hysteresis moves to the region of higher temperatures. i.e. it results in increasing the transition time of the melt in macroscopic and microscopic equilibrium state. The change of sign of the viscosity hysteresis in the v(T) curves from the negative to the positive one is observed if the Cr concentration is more than 12at%.

The concentration dependences of viscosity at various temperatures have been plotted on the basis of the equilibrium viscosity values. The clearly pronounced maximum in the viscosity isotherms has been first found near 12at% Cr. It correlates with the γ-phase in phase diagram.

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