Modeling of friction behaviour during in temperature compression tests on aluminium alloys

Carlo Bruni[1, a)], Daniele Ciccarelli[1]

[1] Department of Industrial Engineering and Mathematical Sciences, Università Politecnica della Marche, Via Brecce Bianche 3, I-60131 Ancona, Italy

[a)]*Corresponding author: c.bruni@univpm.it*

Abstract. In the context of in temperature deformation of aluminium alloys, the information related to the friction acting the tool-workpiece contact interface is very useful. This produces normally an increase in the energy required for deformation. But, the friction acts sometimes also as a guide of the flow material distribution inside the workpiece and then of the deformation itself. In literature typical values of the friction factor for different conditions of temperature can be simply found. In practice, the friction levels can affect the loads required to get given deformations. The present investigation aims at studying in depth the effect of the friction during in temperature deformations on the flow behaviour of aluminium alloys previously deformed under room temperature. The cylindrical specimens were pre-deformed under two different conditions in order to get different hardening situations. The specimens under such conditions were subsequently deformed in the temperature interval of 200° - 300°C by compression tests. Different constant deformation velocities varying in the interval 0.001 – 0.01 s^{-1} were used. The comparison between the flow curve shapes obtained considering the friction, evidenced by the final specimen geometry, and those without friction was made and the results analyzed. It was observed a decrease in the friction contribution with increasing the temperature and with increasing the pre-deformation levels of the specimens performed before testing. Figure 1 shows the comparison between typical flow curves obtained in the case of friction and those obtained in the case of negligible friction. The friction behaviour and the modeling are reported in the paper.

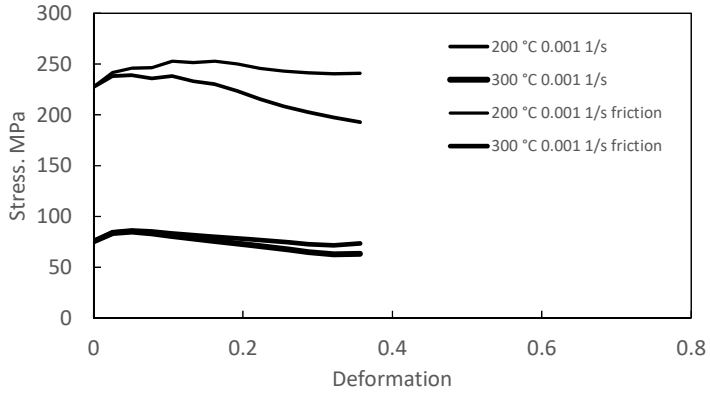

Figure 1 – Typical comparison between flow curves shapes obtained under different conditions in terms of friction.