Determination of Mechanical Properties for the Hydroforming of Magnesium Sheets at Elevated Temperature

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Abstract. Thanks to the low weight, magnesium alloys feature high specific strength and stiffness properties. Thus they prove to be promising materials for todays ambitious automotive light weight construction efforts. Due to their comparative low formability at room temperature the process of magnesium sheet hydroforming can be improved at temperatures higher than 200 °C by the activation of additional sliding planes. This paper illustrates the determination of mechanical properties for the hydroforming of magnesium sheets at elevated temperature. In particular the mechanical behavior at elevated temperature was investigated by means of the tensile test and of the hydraulic bulge test. For the determination of the strains an optical measurement system was introduced into the experimental set-up. The exact knowledge of the strain condition in the area of diffuse necking enabled the determination of the flow curve in the tensile test also beyond the uniform elongation. The influence of temperature and strain rate was analyzed as well as the influence of uni- and biaxial stress state on the flow curve. Using circular and elliptic dies with different aspect ratio the hydraulic bulge test served to determinate the forming limit curves at three different elevated temperatures.