Surface Tension and Density of L625 (Alloy 625) by voestalpine BÖHLER Edelstahl GmbH & Co KG Measured with an Electromagnetic Levitation Apparatus

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The temperature dependent surface tension and density of liquid metals and alloys, among other thermophysical properties, are key-parameters in simulations that are performed by researchers and engineers to better understand and optimize a multitude of production processes that start with a melt. The applications of these simulations do not only include conventional production processes like casting, but also novel techniques in the field of additive manufacturing (AM) like selective laser melting as well as in the preceding process of producing the powder for AM applications like atomization. Hence, there is a strong demand for high quality experimental data, especially for steels and alloys of industrial relevance.

But when measuring surface tension and density of liquid metals and alloys, one faces two serious experimental challenges: the high temperature and the high chemical reactivity of the melt. Both are handled best by using a measurement principle that allows the sample to be processed in a contact- and containerless fashion. At the Institute of Experimental Physics at Graz University of Technology (TU Graz), we use an electromagnetic levitation (EML) apparatus to freely levitate the sample in an inert gas atmosphere so that chemical reactions or interactions are almost completely inhibited. Surface tension and density are measured in a contactless way using the oscillating drop (OD) technique while the temperature is simultaneously measured contactless using pyrometry.

In our current research project, we studied L625 (alloy 625) manufactured by voestalpine BÖHLER Edelstahl GmbH & Co KG, our project partner from industry who is a special steel producer located in Styria, Austria. L625 is used in various industries, among them aerospace, oil and gas and chemical-pharmaceutical industry. Recent results from this study will be presented.

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