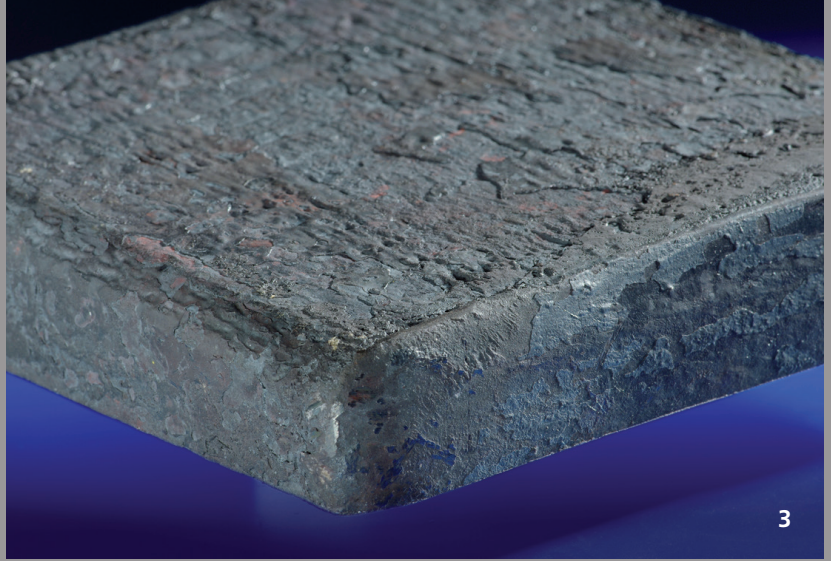

IDENTIFICATION TESTING OF ROLLING BILLETS WITH SCALED SURFACES

Task

Even with highly automated production processes there is always a risk of mixing up different materials. In the production of steel ingots, several hundred different grades of steel are processed; when they are fed into the beginning of the rolling mill, they are controlled mostly manually, meaning that mix-ups cannot be completely ruled out. This may result in substantial economic losses, ranging from damage to tools in the production line to subsequent losses at customers. To recognize such mix-ups before processing begins, all the blocks used should be examined as to their chemical composition.

Method

Laser-induced breakdown spectroscopy (LIBS) has proven itself for the quantitative analysis of metals and material identification of semi-finished products, even under industrial conditions. The challenges in this project are the variety of materials and primary scale layer of the continuously cast billets, which thus have a non-representative surface layer. By using laser pulse repetition optimized for ablation, however, Fraunhofer ILT has been able to expose the base material locally and – in a further step, also laser-based – analyze it directly in the production line.

Result

In the laboratory, laser-induced descaling has been developed in view of the LIBS analysis and of reaching a reasonable ablation depth. Both the removal and the analysis are carried out with the same laser. With cycle times of less than one minute, the optical system has been adapted to the position of the billets and the verification testing has been performed. With a functional model, the procedure is being examined on location for its suitability, thereby helping ILT engineers and industrial partners gain valuable operating experience.

Applications

The primary application is the analysis of metal billets and other intermediate products with scaled surfaces in metal-working. Another field where the combination of ablation and analysis can be applied is measuring depth profiles of the chemical composition down to a depth of several mm.

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3 Section of a continuously cast billet with scaling.