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# Determination of cobalt in low-alloy steels using laser-induced breakdown spectroscopy combined with laser-induced fluorescence

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Abstract: Cobalt element plays an important role for the properties of magnetism and thermology in steels. In this work, laser-induced breakdown spectroscopy combined with laser-induced fluorescence (LIBS-LIF) was studied to selectively enhance the intensities of Co lines. Two states of Co atoms were resonantly excited by a wavelength-tunable laser. LIBS-LIF with ground-state atom excitation (LIBS-LIFG) and LIBS-LIF with excited-state atom excitation (LIBS-LIFE) were compared. The results show that LIBS-LIFG has analytical performance with LoD of 0.82  $\mu\text{g/g}$ ,  $R^2$  of 0.982, RMSECV of 86  $\mu\text{g/g}$ , and RE of 9.27%, which are much better than conventional LIBS and LIBS-LIFE. This work provided LIBS-LIFG as a capable approach for determining trace Co element in the steel industry.

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