Prediction of elemental concentration using of laser induced breakdown spectroscopy aided by artificial neural network, statistical methods of autoregressive integrated moving average model and support vector regression and their combination

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Abstract

In this paper, by using of laser induced breakdown spectroscopy (LIBS) method, the elemental concentrations existed in standard aluminum alloys are measured quantitatively. Pulse laser of Nd:YAG at 1064 nm is irradiated on Al standard samples and analysis is performed by created plasma. Among different methods for estimation of concentration of existed elements in aluminum samples, artificial neural network (ANN), Support vector regression, autoregressive integrated moving average model (ARIMA), kernelized support vector regression (KSVR) and combined method of KSVR-ARIMA are utilized for prediction of element concentrations of Fe, Cu, Zn, Mg, Mn, and Si and obtained results from these methods are compared together. The extracted results show that the combined method of KSVR-ARIMA reports the best prediction values by the least error for the most of the elements.

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