

MOBILE LASER SPECTROCHEMICAL ANALYSERS

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Mobile laser systems of express examination of chemical composition of any solid-state materials without preliminary sampling and chemical processing are developed and created at carrying out measurements with departure to the place of examination that is especially important in the analysis of the objects which are not subject to transportation, in particular, at implementation of antiterrorist activity, at the current inspection of constructions and designs, environmental monitoring in zones of the increased risk, an attribution of unique historical and art values with high insurance cost etc.

The system of a model of 2011 has functional advantages before foreign mobile analogs (prototypes): a double pulse mode of an ablation (growth of level of a useful signal on one-two order) and the raised power (possibility of the analysis of any solid-state materials).

All systems are executed by a modular principle that gives possibility of dismantling, transportation, assembling and operation by one operator.



Fig 1. The system of a model of 2011.

The main technical characteristics of a model of 2011 are given below.

YAG:Nd laser: flash lamp pumping; a double pulse mode of generation; 1.06 microns; energy of each pulse up to 100 mJ; duration of a pulse on a half-height of 10-12 ns; frequency of repetition up to 10 Hz; stability on energy of 2 %; delay time between pulses of 0-80 microsec.

Polychromator: Cherny-Turner optical scheme; focal length of 200 mm; relative aperture of 1:3.6; four diffraction gratings, diffused light of 7×10^{-5} ; automatic adjustment of a spectral range, choice of a diffraction grating; maximum speed of drives of 10000 steps/second; reciprocal linear dispersion of 4.12 nm/mm (for 1200 grooves/mm); spectral range of 200-1000 nm; reproducibility of installation of wavelength of 0.036 nm; step of a wavelength tuning 0.012 nm.

OMA is on the basis of a linear CCD with 3648 photosensitive pixels with the sizes of 8x200 microns. The range of spectral sensitivity on minimum level of 0.1 is of 200-1060 nm.

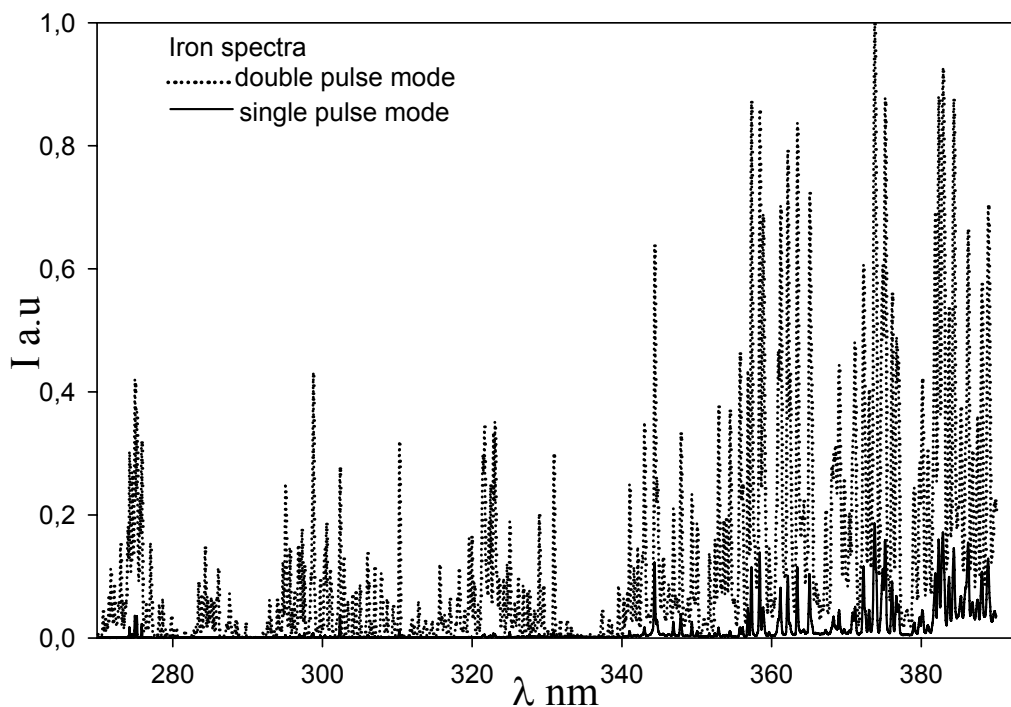


Fig 2. Iron spectra in two modes of ablation.

Established equipment and techniques have been tested successfully in stationary and field conditions, in particular, at emergency constructions and buildings, in national museums of Belarus, including the well known Polotsk and Nesvij.



Fig 3. The examination of corrosionless metal in the aquapark.

At present, the development of the most compact system of a model of 2012 with a diode-pumped laser active medium and double pulse mode of generation is finishing.



MOBILE LASER SPECTROMETER

APPLICATIONS:

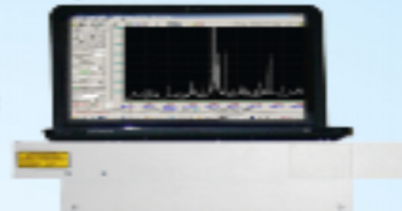
- | | |
|-------------------|-----------------------|
| Metals | Coatings |
| Minerals | Soil |
| Cement | Plants and Biological |
| Pharmaceuticals | Food Stuff |
| Cultural Heritage | Explosives |

ADVANTAGE:

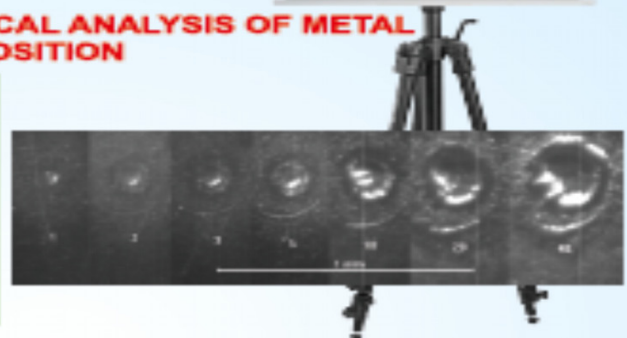
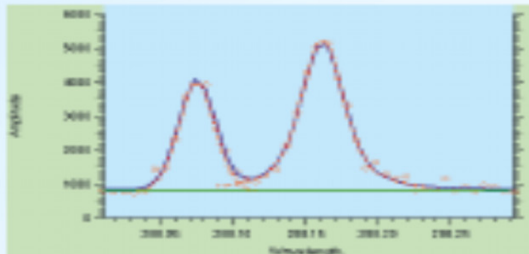
Laser-induced breakdown spectroscopy (LIBS) is a simple, rapid, real-time analytical technique.

SPECIFICATIONS:

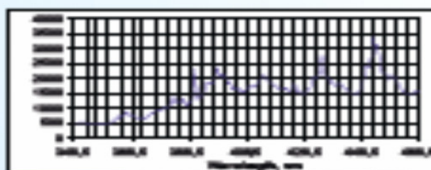
Laser: Nd:YAG, 1064 nm, double pulse, 100 mJ/pulse;
Optical: 0.38 m Czerny-Turner;
Spectrograph: 190 – 950 nm wavelength range
Detector: Linear CCD, 3648 pixels
PC Control: USB, plug and play operation, Windows



LASER SPECTROCHEMICAL ANALYSIS OF METAL COMPOSITION



LASER SPECTROCHEMICAL ANALYSIS OF INDUSTRIAL OBJECTS



Laser spectrochemical microanalysis of a surface of silicon plate



Laser spectrochemical analysis of reinforced concrete in buildings

LASER EXAMINATION AND CLEANING OF HISTORICAL AND ARTISTIC VALUES



Examined by laser microanalysis of aged bronze crosses worn next to the skin.



Laser spectrochemical microanalysis of historical gold and silver artefacts