INFLUENCE OF THE ENERGY IMPACT ON STRUCTURE FORMATION AND PROPERTIES OF DEPOSITED COATINGS*

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Purpose of work

Study of the influence of surfacing modes on the characteristics of heat and mass transfer of the electrode metal, on the formation of a dispersed structure in coatings and increasing their properties when modifying the molten metal using pulsed energy effects.

Experimental procedure

Feb-315 "MAGMA"

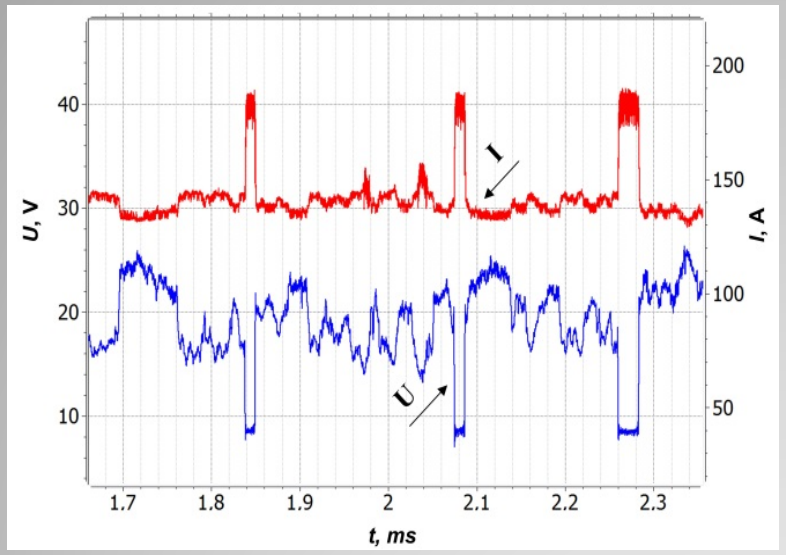
Metallographic microscope Neophot-32

Results and discussion

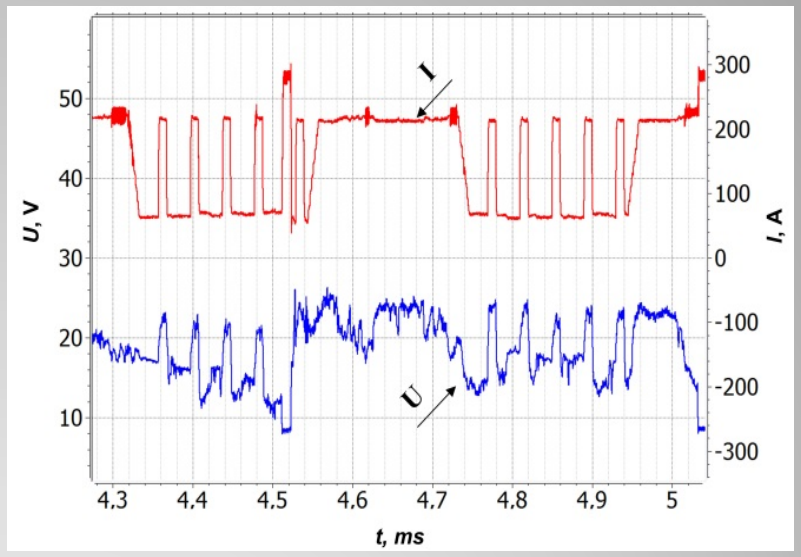
Table 1. Modes of surfacing coatings

№	Mark's electrode (welding conditions)	U_{avg}	I_{avg}	I_{pulse}	I_{pause}	t_{pulse}	t_{pause}	$N_{S/c}$	$T_{S/c}$ 10^{-3} s	Kd	$I_{S/c}$	q
1	EN-60M (DCM)	15,4	103,8	-	-	-	-	21	7,9	0,32	138	0,487
2	EN-60M (MCM)	15,5	179,6	110	40	0,3	0,3	43	6,1	0,29	153	0,452

where $U_{average}$ – secondary voltage, *V*; $I_{average}$ – average current, *A*; I_{Pulse} , $I_{Constan}$ – current, pulse and pause, *A*; t_{pulse} ,t_{pause} – pulse duration and pause, *s*; $N_{Short\ circuit}$ – the number of short circuits, pc.; $T_{Short\ circuit}$ – the average duration of the short circuits, s 10^{-3} *S*; K_d – coefficient of variation of the duration of the short circuits; $I_{Short\ circuit}$ – maximum short-circuit current, *A*; *q* – heat input when welding, k*J*/mm. DCM – surfacing on direct current, MCM – surfacing with low-frequency modulation of energy parameters of the mode.

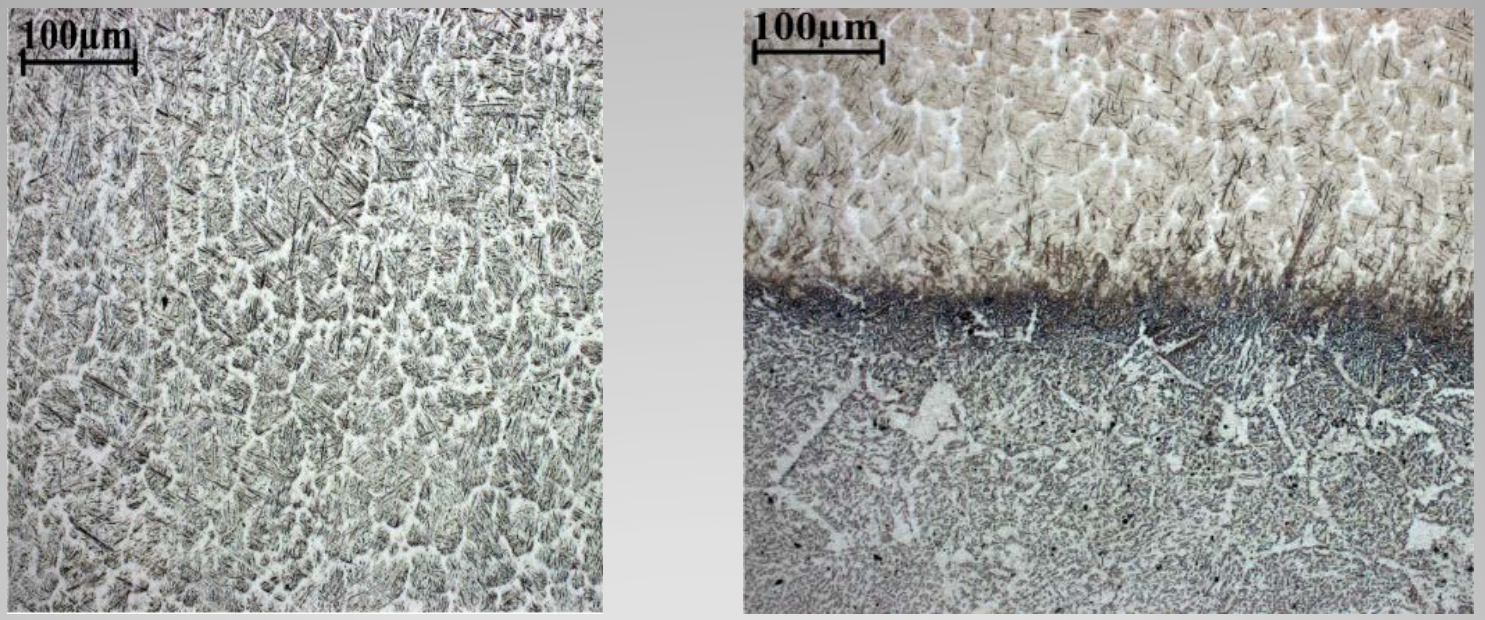


(a)



(b)

Figure 1. Waveforms of arc current and voltage during welding with DCM electrodes (a) and (b) with a pulse change in energy parameters (MCM).



(a) (b)

Figure 2. Microstructures of the deposited composite coating with EN-60M electrodes (a) and the "coating - steel 09G2S" border (b).

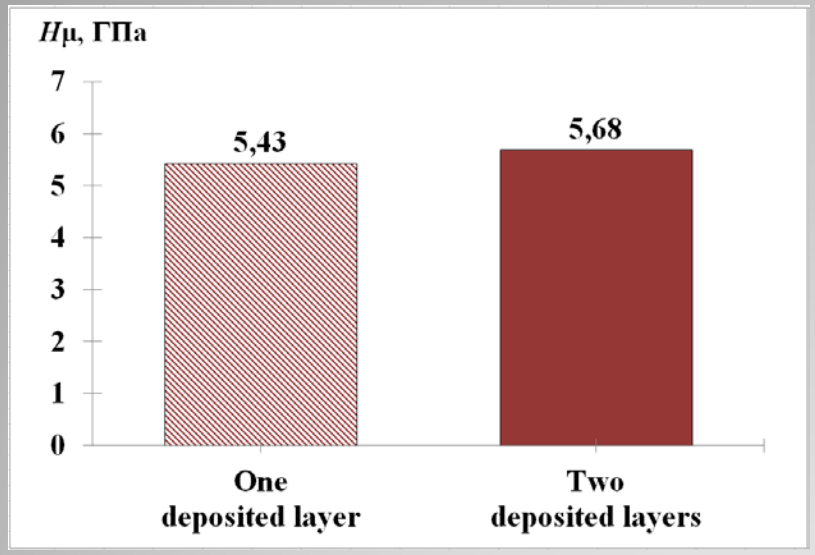


Figure 3. Histograms of wear resistance of coatings deposited in DC modes in one and two layers.

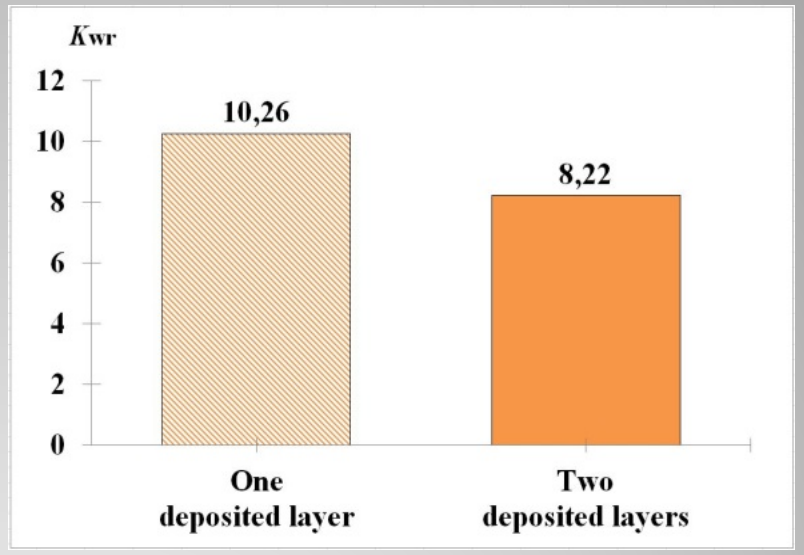


Figure 4. Histograms of the average level of wear resistance of coatings deposited with T-590 electrodes in DC modes, made in one and two layers.

Conclusions

- A new integrated approach to improving the properties of coatings using surfacing methods in controlled heat input modes, which contributes to the modification of the formed metal and improve the performance properties of processed products.
- It is Determined that the control of energy parameters of modes during surfacing allows reducing the structural heterogeneity of coatings across the cross section by reducing the size of their structural components
- The applied diagnostic complex of registration of fast-flowing processes of heat and mass transfer allows to perform a quantitative assessment of the influence of energy parameters of the mode on the characteristics of heat and mass transfer, as well as to ensure high performance of the research process.

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