The x-ray diffraction study of the composition of the powder materials from the waste steel X13

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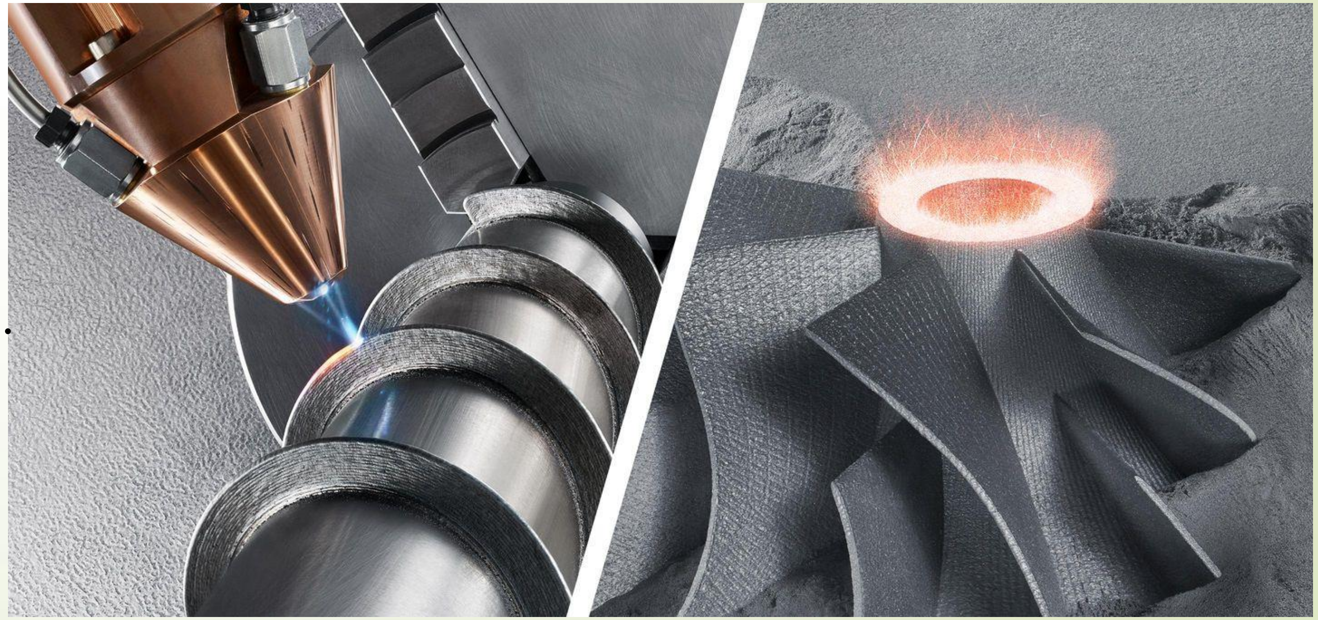
Introduction

To restore and protect the surfaces of parts using a layer of molten metal, various methods of surfacing are used, differing from each other by melting methods and compositions of the welding medium: electric arc, flame, plasma, laser, induction, etc. With this technology, metals of various chemical composition, including copper, bronze, cast iron, as well as nickel, cobalt and chromium alloys can be deposited on the working surfaces of steel structures. There are several ways to obtain such powder materials. The most promising method for obtaining powder materials is the electro-erosion dispersion method (EED), which is distinguished by its ecological purity of the process and relatively low energy expenditure.

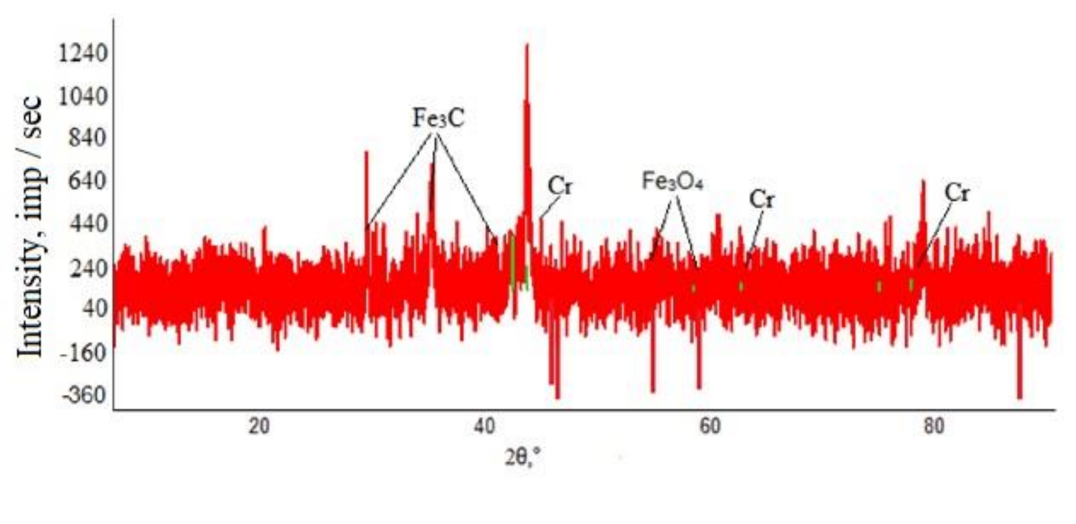


Materials and techniques

To study the structure of the particles of the obtained powders, their X-ray structural analysis was performed on a Rigaku Ultima IV X-ray diffractometer

Rigaku Ultima IV X-ray diffractometer

Conduct X-ray analysis



The powder XRD pattern

2θ, (degree)	Height (Hz)	Intensity W (degree)	Size (angstroms)
19.67(3)	113(31)	0.10(8)	4.509(8)
29.22(3)	188(40)	0.18(8)	3.054(3)
35.50(4)	343(54)	0.55(12)	2.527(3)
43.09(7)	146(35)	1.0(4)	2.098(3)
44.523(16)	773(81)	0.42(7)	2.0333(7)
57.387(16)	118(32)	0.36(17)	1.6044(4)
62.8(2)	73(25)	0.8(5)	1.479(5)
64.929(10)	181(39)	0.17(6)	1.4350(2)
82.37(13)	118(32)	0.7(4)	1.1698(15)

The x-ray maxima of the powder in lighting kerosene

On the experimental radiograph there are strong reflexes corresponding to:

- phase Fe_3O_4;
- phase Cr;
- phase Fe_3C.

Conclusion

- The phase composition of the powder, obtained by the method of EED, is determined by the nature of the WF: the presence of carbon, the dielectric constant and boiling point. Dispersion of waste alloys of ball-bearing steel in lighting kerosene led to carbon enrichment and the formation of the Fe_3C phase.
- Thus, the phase composition of powders, obtained by the method of EED, is influenced by the complex of thermochemical properties of working fluids. This can determine the choice of WF to obtain a given composition of powders.
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