IOP Conference Series: Materials Science and Engineering 2018 vol.412 N1

Plasma electrolyte produce 17-4PH powder for use in 3D MicroPrint technology

Kashapov R., Kashapov L., Kashapov N.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© Published under licence by IOP Publishing Ltd. The work is devoted to the investigation of the processes of obtaining fine powders from steel 17-4PH, for the purpose of their further application in 3D MicroPrint technology. This technology is a type of selective high-resolution laser melting of ~ 30 μm. In 3D MicroPrint technology, a powder of less than 5 microns is used, which in turn necessitates the development of new cheap methods for obtaining spherical fine powders. The process of plasma-electrolyte powder production of 17-4PH steel was studied, the discharge burning conditions and conditions for the arrangement of the electrode system for obtaining powders with dimensions less than 5 μm were selected. The proposed method is simple and does not require expensive equipment.

http://dx.doi.org/10.1088/1757-899X/412/1/012091

References

[1] Chen J, Wang X and Zuo T 2003 The micro fabrication using selective laser sintering micron metal powder Proceedings of SPIE 5116 647-51
[2] Exner H, Regenfuss P, Hartwig L, Klotzer S and Ebert R 2003 Proceedings of the Euro-uRapid (Frankfurt/Main) Microsintering of miniature and precise components and tools
[3] Kathuria Y P 1999 Microstructuring by selective laser sintering of metallic powders Surface and coating technology 116-119 643-47
[4] Regenfuss P, Hartwig L, Klotzer S, Ebert R and Exner H 2004 Microparts by a novel modification of selective laser sintering SME Technical paper TP04PUB185
[5] Regenfuss P, Hartwig L, Klotzer S, Ebert R, Brabant Th, Petsch T and Exner H 2005 Industrial freeform generation of microtools by laser micro sintering Rapid Prototyping Journal 11 18-25
[6] Regenfuss P, Streek A, Hartwig L, Klotzer S, Brabant Th, Horn M, Ebert R and Exner H 2007 Principles of laser micro sintering Rapid Prototyping Journal 13 204-12
[7] Torible Y et al 2007 Applied Physics Letters 91 041501
[8] Allagui A et al 2011 Electrochemica acta 58 12-18
[9] Allagui A et al 2014 Journal of Power Sources 262 178-82
[10] Richmonds C et al 2008 Applied Physics Letters 93 131501
[11] Chang F-C et al 2010 Journal of Vacuum Science and Technology A28
[12] Lal A et al 2008 Electrochemistry communications 10 488-91
[13] Denisov D G, Kashapov N F and Kashapov R N 2015 The appearance of shock waves in the plasma electrolytic processing IOP Conference Series: Materials Science and Engineering 86 012005
[14] Kashapov L N, Kashapov N F, Kashapov R N and Denisov D G 2016 Plasma electrolytic treatment of products after selective laser melting Journal of Physics: Conference Series 669 012029
[15] Kashapov L N, Kashapov N F and Kashapov R N 2013 Research of the impact acidity of electrolytic cathode on the course of the plasma-electrolytic process Journal of Physics: Conference Series 479 012011

[16] Kashapov R N, Kashapov L N and Kashapov N F 2017 Research of plasma-electrolyte discharge in the processes of obtaining metallic powders Journal of Physics: Conference Series 927 012086

[17] Kashapov R N, Kashapov L N and Kashapov N F 2017 Analysis and development of methods for obtaining metallic powders for selective laser melting IOP Conference Series: Materials Science and Engineering 240 012071

[18] Kashapov R N, Kashapov L N and Kashapov N F 2015 The research of anodic microdischarges in plasma-electrolyte processing IOP Conference Series: Materials Science and Engineering 86 012019