

Some numerical simulation results of the dynamic temperature distribution in dc plasma torch Thermoplasma 50-01

Saifutdinov A., Fadeev S., Fayrushin I.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© Published under licence by IOP Publishing Ltd. A DC plasma torch "Thermoplasma 50-01" has been modeled and simulated by developing a 2D axisymmetric model of laminar flow and heat transfer coupled to electromagnetic fields. As a result of the numerical solution, the dynamics of the formation of the temperature field and the velocity field in the plasma torch channel and at its exit is presented. The numerical results of the gas temperature and axial velocity result to be quite satisfactory.

<http://dx.doi.org/10.1088/1742-6596/927/1/012047>

References

- [1] Pfender E 1999 Plasma Chem. Plasma Proc. 19 1-31
- [2] Murphy A B 1996 J. Phys. D: Appl. Phys. 29 1922-1932
- [3] Wenxia Pan, Xian Meng, Xi Chen et al 2006 Plasma Chem. Plasma Process 26 335-345
- [4] Robert C and Tucker Jr 2013 Thermal Spray Technology 5A (ASM International) ASM Handbook 412
- [5] Ilyushchenko A F, Shevtsov A I, Okovity V A et al 2011 The formation of thermal coatings and their modeling (Minsk, Belarus: Nauka) 357
- [6] Zasyplin I V and Zhukov M F 2006 Thermal Plasma Torches: Design, Characteristics, Application (Cambridge: Cambridge International Sciences Publishing) 720
- [7] Kuzmin V I, Mikhal'chenko A A, Kovalev O B, Kartaev E V and Rudenskaya N A 2012 J. of Thermal Spray Technology 21 159-168
- [8] Kuzmin V, Cartan E, Kornienko E et al 2014 Plasma spraying of powder coatings with gas dynamic focusing of the dispersed phase. Current problems in engineering = Actual problems in machine building: 1 Materials Intern. Scientific And Practical. Conf., Novosibirsk (Novosibirsk, March 26, 2014) 482-488 Publishing House of the NSTU
- [9] Kuzmin V I, Grigoriev S N, Kovalev O B et al 2013 Friction and Wear 34 221-226
- [10] Kuzmin V I, Mikhal'chenko A A, Kartaev E V et al 2012 Journal of Thermal Spray Technology 21 159-168
- [11] Trelles J, Chazelas C, Vardelle A and Heberlein J 2009 Journal of Thermal Spray Technology 18 728-752
- [12] Vardelle A, Moreau C, Themelis N and Chazelas C 2015 Plasma Chem Plasma Process 35 491-509
- [13] Colombo V. and Ghedini E 2005 Time dependent 3-d simulations of a dc non-transferred arc plasma torch: anode attachment and downstream region effects Proc. ISPC 169-170
- [14] Marchand C, Chazelas C, Mariaux G and Vardelle A 2007 J. Thermal Spray Tech. 16 705-712