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Numerical simulation of tungsten particle trajectory and heating process in radio frequency thermal plasma spheroidization

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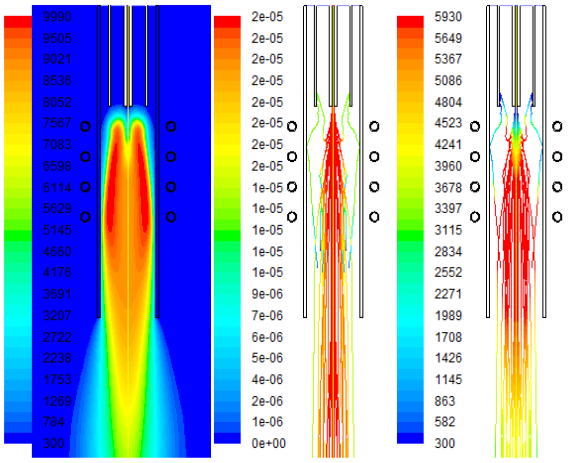
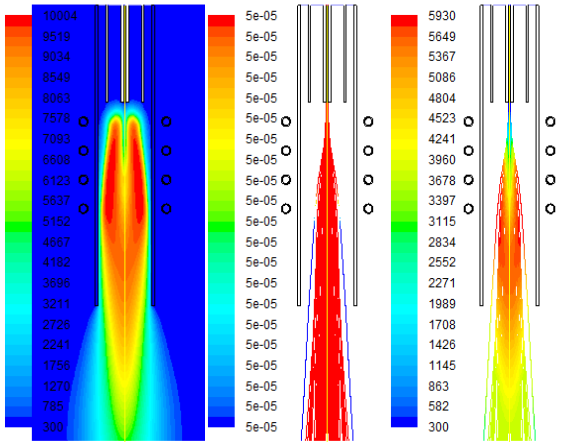
Radio frequency (RF) thermal plasma has many good characteristics such as high temperature, high enthalpy and can be used to prepare the spherical tungsten particle[1-3]. Study on heating process of tungsten particles in RF thermal plasma can provide theoretical guidelines for improving preparation process of plasma spheroidization. In this paper, the effect of precursors particle size, coil current frequency and powder feeder rate (FR) on motion trajectories and heating process of tungsten particles in thermal plasma have been studied by means of numerical simulation with FLUENT software. The results show that the tungsten particles can be heated to higher temperature during the spheroidization process when coil current frequency is higher; small particles can absorb enough heat from plasma and be heated to melt; Decrease of powder feeder rate can increase the energy get from plasma, thus improving the spheroidization effect of tungsten particle.



(a) FR=3.6kg/h, D_p=20μm



(a) FR=7.2kg/h, D_p=50μm

Figure Effect of the tungsten powder feed rate and precursors particle size on the temperature fields (left) in the discharge, particle trajectories (mid) and particle temperature (right)

References

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