Radio frequency (RF) thermal plasma is one of the most ideal methods for the spherical powders manufacture for 3D printing due to its unique properties. To improve the performance of spherical powder, the changes of properties of plasma jets were investigated by the emission spectrometer before and after the precursor tungsten powders injected with the average size of 35.47μm, and the temperature, velocity and particle size of powders were monitored by the particle online monitor of DPV2000 at the same time. The electron temperature of plasma was calculated from the emission spectrum of Ar II spectral lines by Boltzmann plotted method, while its electron density by the Stark broadening with the spectral line of Ar 696.54nm. The experimental results demonstrated that the intensity of emission spectrum, electron temperature changed from 0.6ev to 0.2ev and density about 10^{15} cm^{-3} were both decreased after the injection of precursor tungsten powders. The temperature and velocity of tungsten particles in the plasma decreased with the increasing of axial distance away out of the plasma generator, and its average size of spherical tungsten powders was about 32.556μm. The spheroidization ratio of tungsten powders with plasma processing can reach up to 85% under that operating conditions in this study. It was also found that the thermodynamic process of tungsten powders in the plasma could be divided into three stages: melted, quenched and solidified. Those results can provide an experimental basis for the efficient preparation of spherical powders.

References