

# Spectral Diagnosis Of Hall Thruster Coupling With Hollow Cathode

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**Abstract:** Hollow cathode is one key component of electric propulsion system, and it is difficult to explain the relationship between hollow cathode operating parameters and thruster performance. But spectral diagnosis of Xenon plasma from hollow cathode makes it possible to evaluate the coupling relationship between Hall thruster and cathode. In a 250V Xenon Hall thruster experiment, on certain operating points of anode flow rate and magnetic field, cathode flow rate and keeper current have been changed. It is found that intensity of 3 Xenon atom spectrum (823.2nm, 828nm, 881.9nm) as well as thruster performance changed significantly as cathode operating parameters altering. As is seen in Fig.1 , with keeper current equaling 2 A, as cathode flow rate is increased from 1 sccm, intensity of 3 Xenon spectrum rise slowly at first, then decrease sharply at 4 sccm flow rate , and finally keep stable after flow rate exceeding 8 sccm . Result shows that characteristics of plume and oscillation of the thruster have got better and the thruster has been more efficient, when Xenon spectrum intensity is low .

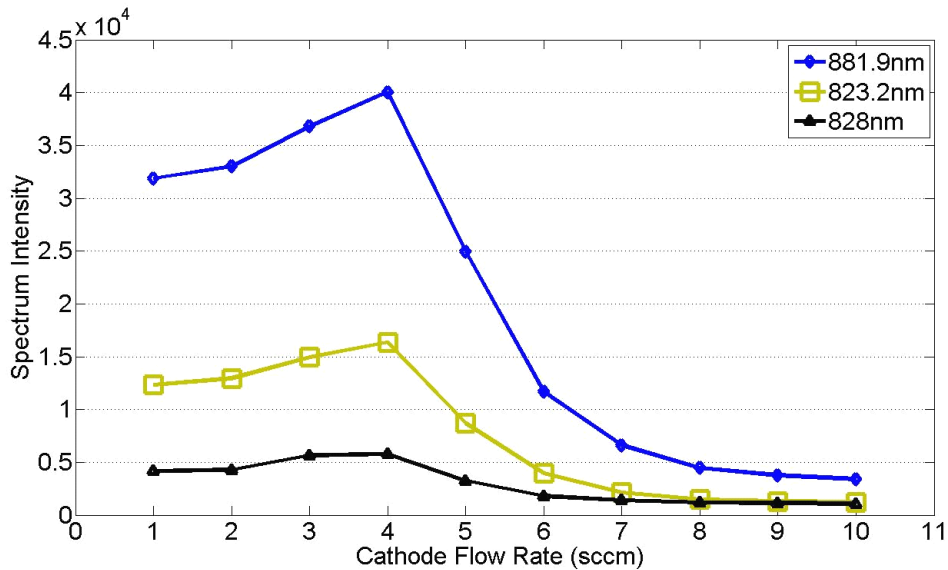


Fig.1 Intensity of 3 Xenon spectrums (823.2nm,828nm,881.9nm,)at representative cathode fluxs in the 1-10sccm when keeper current intensiy =2A

Similar result appears when keeper current is changed . As is seen in Fig.2 , with cathode flow rate equaling 8 sccm , intensity of 3 Xenon spectrum decrease sharply as keeper current is increased from 0 A, and then it is almost invariable after current exceeding 2 A . It is also found that thruster performance get better when spectrum intensity is low.

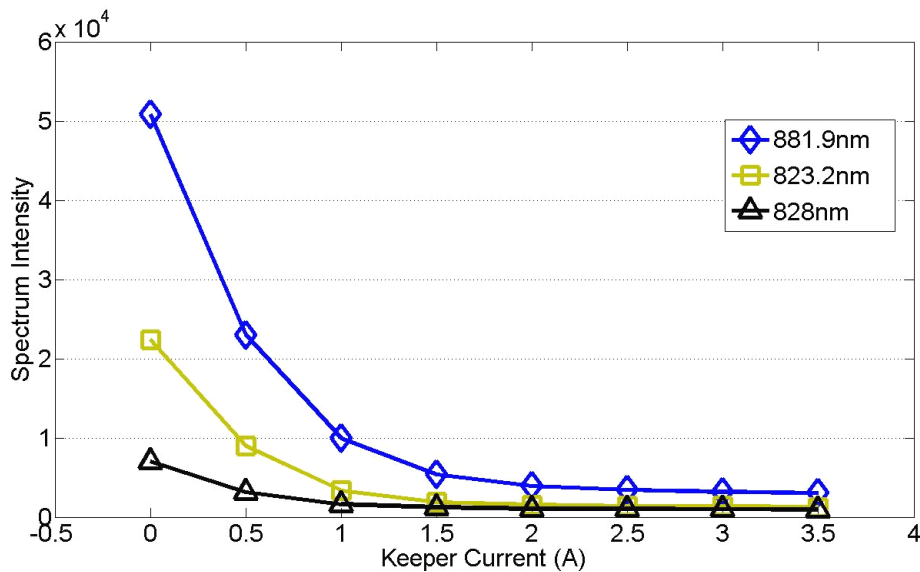


Fig.2 Intensity of 3 Xenon spectrums (823.2nm,828nm,881.9nm,)at representative keeper currents in the 0-3.5A when cathode flux =8sccm

To be concluded , low cathode plasma spectrum intensity represents stable thruster discharge condition and high efficiency from one side .

**Key words:** Hollow Cathode ; Hall Thruster ; Coupling ; Spectral Diagnosis;

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