

Abstract Submitted
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PEGASES - plasma propulsion with electronegative gases¹ ANE AANESLAND, PASCAL CHABERT, GARY LERAY, ALBERT MEIGE, JEAN-LUC RAIMBAULT, LPTP, Ecole Polytechnique — A new concept of plasma propulsion is proposed, where the thrust is provided by both positive and negative ions resulting in a globally neutral beam downstream (in space). The basic idea is to create an ion-ion plasma (electron free region) at the periphery of a highly ionised plasma core such that positive and negative ions can be extracted either simultaneously or alternately by dc biased extractor grids. As the extracted beam is globally neutral there is no need for a neutralizer downstream. The recombination of positive and negative ions is very efficient compared to ion electron recombination. Hence, a fast recombination downstream of the thruster is expected, suppressing the common problems of a downstream plasma behind the thrusters. The ion-ion plasma region is formed in the periphery of a moderately magnetized plasma where the electrons are confined along the magnetic field lines while the ions are not: The applied magnetic field therefore acts as an electron filterer resulting in a stratified plasma with an electro-positive core (electrons and ions) and an ion-ion plasma (electron free) at the periphery. The propellant has to be a strongly electronegative gas in order to effectively create negative ions. The best candidate seems to be iodine, I₂, which has a high electron affinity, has a low ionisation threshold, is inexpensive, and does not require heavy and large gas tanks since it is in solid state with a high vapour pressure at room temperature.

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