Proposal Code : PDF – FusionTech -0001	
Title	Simulation and experimental study of Coulomb Cluster both in RF and DC discharges
Abstract	A new custom designed high temperature reactive cylindrical sputter coating system is developed to deposit Er_2O_3 coating on internal surface of a pipe. The said coating is intended as tritium (hydrogen isotope) permeation barrier coating, which is required on the inner surfaces of the pipes carrying Tritium in Nuclear Fusion Reactors of future. Er_2O_3 can have several poly-morphs such as amorphous, cubic, monoclinic and hexagonal. The desired coating needs to be optimized for cubic structured Er_2O_3 with compact micro-structure.
	The coating system consists of a high vacuum chamber with actively cooled walls. The chamber is surrounded by water cooled Cu coils made of 3 pancakes each in Helmholtz geometry to produce uniform linear magnetic field along the surface of the cathode inside the chamber. The cathode too is actively water cooled whereas its surrounding (substrate pipe) is heated upto 700 °C uniformly, making the design, assembly and operation a bit challenging. Moreover, the substrate heater is DC powered to avoid interference with the magnetic field. The system is equipped with the Gas feed systems for injecting calibrated Agon and Oxygen gases into the chamber for reactive sputtering process. It also consists of an arc protected DC sputtering poser supply. This system will be operated to carry out deposition on 250 mm long cylindrical substrates and find the optimum coating parameters for the desired quality of the coating in terms of its crystallinity, micro-structural compactness and stability in atmosphere. For this, the deposited samples will be required to be cut and prepared for suitability to characterization techniques and the characterization will be carried out at FCIPT facilities. In addition to above activity, the candidate will also work on planar magnetron sputter coating system for development of Hydrogen permeation facilitating Pd coating or other functional coating as an when

	required by the section activities. The candidate may also join experiments on TPB coating through dip coating method using solution being developed in-house
Research Focus Areas	Planar magnetron is a commercially available apparatus exploiting magnetic field component parallel to surface produced by the permanent magnets beneath the sputtering surface, for electron confinement and consequent higher ionization resulting in high sputtering rate. The cylindrical counterpart designed and developed at IPR is a customized analogue - not available commercially. Due to geometry of the substrate (Pipe), the sputtering surface is also cylindrical and not planar. Due to this geometrical requirement, the magnetic field parallel to surface is produced by the external Helmholtz Coils instead of the permanent magnet in the planar case. Substrate heating has to be radiative in present case as compared to conductive in planar sputtering.
Qualifications	PhD in Physics
Desired Experience	Candidate should have experimental skills along with a good knowledge of the characterization technique to understand and interpret the results. Candidate should also possess good skill for technical writing for publishing the research work.
Other remarks	The candidate may also work on planar magnetron sputter coating system for development of Hydrogen permeation facilitating Pd coating or other functional coating along with the experiments on TPB coating through dip coating method using solution being developed in-house.