

## **Science-Based Development of Plasma & Fusion Technologies**

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Plasma, the fourth state of matter, has properties that are very different from the other three states, viz., solid, liquid and gas. There are three major reasons. Firstly, plasmas are a mixture of free electrons, ions and atoms/molecules; local imbalances in the density of electrons and ions and their velocities leads to the generation of local electromagnetic fields, which in turn affect plasma behaviour. Secondly, unlike the other three states of matter, plasmas can exist over several orders of magnitude in temperature and pressure. Hence the thermodynamic and transport properties of a plasma vary over a wide range. Thirdly, plasma behaviour also depends on the method of production, which sometimes leads to a non-equilibrium plasma. As a result, apart from the well-known application in Nuclear Fusion systems, plasmas lend themselves to a variety of industrial & societal applications, covering areas like waste disposal, industrial tools, textiles, agriculture, medicine/health, defence and space. This talk will present an overview of the Indian programme in developing (a) Nuclear Fusion systems & technologies and (b) Industrial/societal applications of plasmas, as well as the use of high performance computing for their understanding and optimization.