

Surface Analysis of Plasma-Facing Components in Tokamaks

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Surface of plasma facing components interacts with particles generated from plasma. High/low energetic ions, neutrals, and radicals bombard the surface of the PFCs during the plasma operation. Depending on the energy and incoming species, the plasma-surface interaction can be categorized and identified: The surface experiences several different physical and chemical processes. In low temperature plasma, deposition/etching of thin films, surface treatment, and plasma sterilization are well known examples. Edge region of tokamak discharges show, except for the high particle and heat flux region such as divertor and limiter, similar density and temperature at main chamber as in the case of low temperature processing plasmas, which lead to similar plasma-surface interaction: deposition/erosion of PFC materials and fuels.

Regions like divertors and limiters where the surface experiences high particle and heat flux. Consequently the surfaces are eroded and eroded materials are transported to a “relatively cold” places and redeposited there. Main topics of surface analysis in tokamak plasma-surface interaction research are:

1) Erosion/re-deposition on PFCs: The questions related to this topic are, “how much materials are eroded?”, “how much of them will be re-deposited?”, “what is the physical and chemical properties of re-deposited materials?”, and etc.

2) Change of surface of PFCs: “what happened to the surface during/after the erosion?”

3) in-vessel dust formation and estimation of conversion factor: loosely bonded re-deposited layers will be detached from the surface and finally become in-vessel dusts.

In this paper, these topics are introduced and discussed, and some of results from KSTAR will be reported.