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Amorphous carbon films for reducing incrustation in urological Catheters

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This project is being carried out in cooperation with NTTF Coatings GmbH, Rheinbreitbach, Germany. It involves development of thin film coating processes on the inner surface of plastic catheters, and testing the suitability of deposited film in reducing incrustation. Our institute is responsible for the first part of this project. Our partner, NTTF coatings GmbH, evaluates the film coated catheters for reducing incrustation.

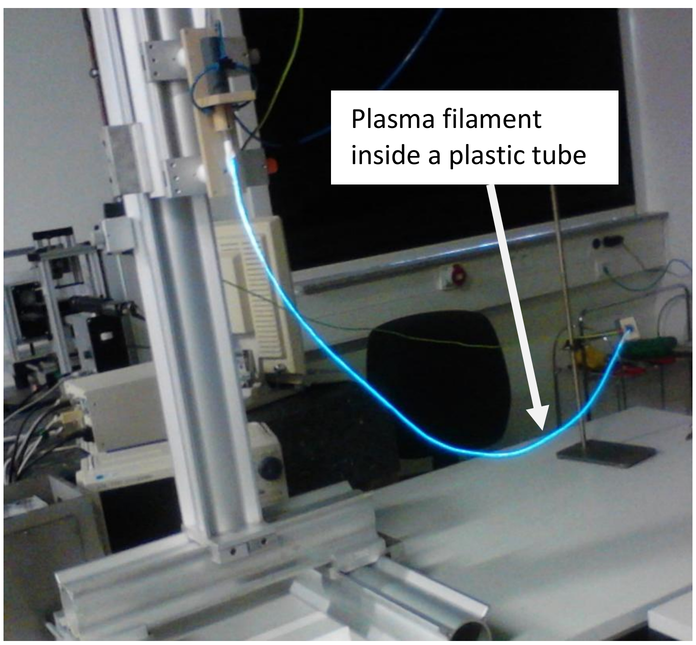

Fig. 1. Filamentary plasma ignited inside a plastic tube (catheter) in argon precursor mixture in order to coat film on the inner surface of the catheter (length 150 cm, tube thickness about 50 µm, inner diameter < 2 mm).

As part of our DFG Research Group (FOR 1123 "Physics of Microplasmas") project, basic science behind the usage of atmospheric pressure filamentary plasma for film coating on the inner surface of tube are investigated. This ZIM project mainly deals with application aspects of filamentary plasma, particularly on a-C:H and a-C:H:N film coating on the inner surface of catheters. As part of this project, we receive different types of catheters from our partner. We optimize a-C:H and a-C:H:N films deposition condition for each kind of catheter and coat their inner surface (as shown in Fig. 1).

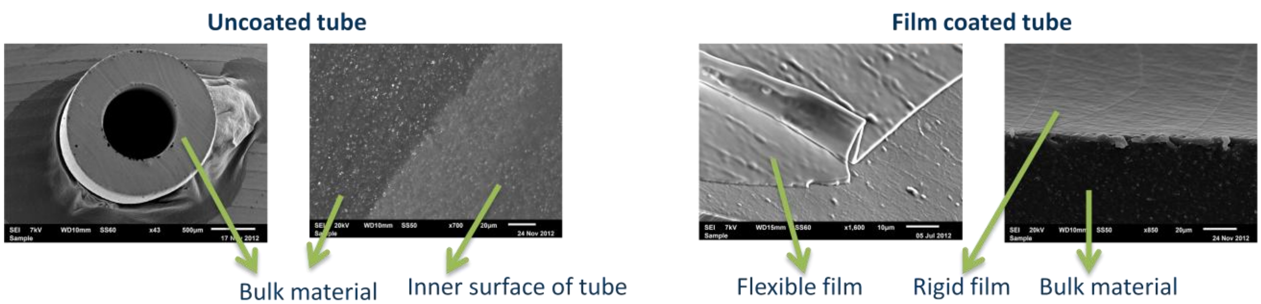

Fig. 2. SEM images of uncoated and film coated plastic tubes (catheters).

Preliminary analysis of coated films are carried out at our institutes, which includes surface morphology and film thickness analysis using SEM (as shown in Fig. 2), film elemental analysis using XPS and EDX, gas permeation measurement using MOCON, functional group analysis using ATR-FTIR, film roughness measurement using LSM and Profilometer, etc. Currently, film coating is carried out in a laboratory-scale experimental-type filamentary plasma source, which is capable of generating plasmas for several applications. At the end of this project, a simple prototype of this plasma source will be constructed aiming only for film coating on the inner surface of tubes.