

IUVSTA Workshop on reliable sensing and control of reactive plasmas

VENUE: Cerklje na Gorenjskem, Slovenia, EU

DATES: 7th – 12th March 2021

PROPOSED BY: Slovenian vacuum society

SUPPORTED BY: Plasma and Electronic Materials Divisions

MOTIVATION: Towards 4th Industrial revolution (Industry 4.0)

INDUSTRY 4.0: Smart production lines

Digital twins (to predict all scenarios)

Robotisation (no uneducated workers)

Remote control (for urgent cases only)

ONLY FEW PLASMA TECHNOLOGIES MEET STANDARDS OF INDUSTRY 4.0

OBSTACLE TO MEET STANDARDS OF INDUSTRY 4.0: Lack of reliable sensors for real-time control of plasma parameters

CURRENT PRAXIS:

Control of discharge parameters

(discharge power, coupling, pressure, flows of gases etc)

**Manual adjustment of parameters
(by engineers)**

INDUSTRY 4.0

Control of plasma parameters

(density or reactive species, fluxes of reactive species and radiation)

**Automatic adjustment, depending
on the signals provided by sensors**

The plasma parameters don't depend only on discharge parameters, but also on:

- **Peculiarities of materials to be processed;**
- **History of the production line;**
- **Spatial and temporal gradients are frequent.**

PLASMA SENSORS FOR INDUSTRY 4.0 SHOULD BE:

- **Reliable;**
- **Reasonably priced;**
- **Accurate;**
- **Two independent types of sensors for one parameter;**
- **Sensors distributed in the reactor (to detect spatial gradients);**
- **Long life-time;**
- **No need for frequent calibration;**
- **As simple as possible.**

Development of innovative sensors is the job for plasma scientists, not for engineers in the industry. Engineers don't really understand non-equilibrium thermodynamics and quantum physics.

WORKSHOP SCOPE:

- **State of the art;**
- **Identification of gaps;**
- **Presentation of innovative ideas;**
- **Discussion of innovative ideas.**

WORKSHOP ORGANIZATION:

- **Invited talks by world-leading groups (up to about 20 speakers)**
- **Formal discussions (round tables)**
- **Networking (informal discussions)**

WORKSHOP VENUE:

- **Remote hotel (no way to escape, no other guests but participants)**
- **All-inclusive package**
- **20 km from Ljubljana airport**
- **Organizers will meet all participants at the airport.**