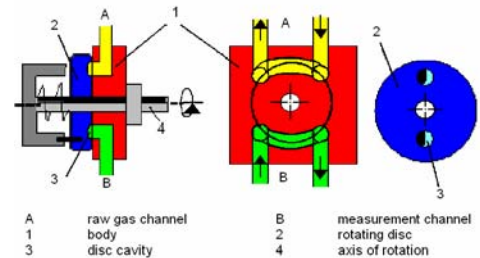


Case Studies  
**Low friction and low wear  
 PVD DLC-coating**

**Sulzer Innotec**

**The Problem**

Aerosol and gas analysis often requires gas dilution. This is a difficult task and is achieved by a new method developed at ETH Zurich, Switzerland. In the new micro diluter the raw gas is guided past a rotating disc with cavities which are filled by diffusion and convection. As the disc rotates, the raw gas in each cavity is transported into a second channel where it is mixed with particle free air and diluted. Because the rotating disc moves against a metal body without lubrication, abrasion and particle adhesion lead to wear and consequently to leakage, which limits the service time and compromises the measurements.



*Block diagram of the gas dilution system*

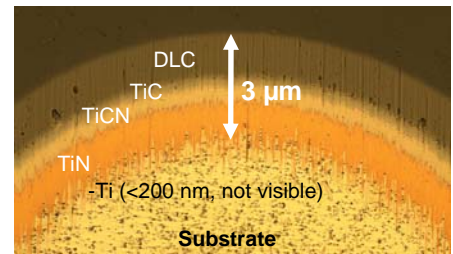
**The Task Involved**

To ensure the long-term measurement reproducibility of the gas analyser, the wear of diluter parts and the adhesion of aerosols of nanometer size were to be minimised. To achieve this goal, a surface modification with the following properties was to be applied to the sliding surfaces of body and disc:

- Preservation of tightness against gases and nanometer sizes particles
- No adhesion of aerosols and particles (sizes ranging from nanometer to micrometer)
- Low friction
- Low wear
- Service temperature up to 200°C

**The Solution**

Sulzer Innotec's multilayer PVD DLC (diamond like carbon) coating with a thickness of 3 µm was applied to both sliding surfaces. DLC withstands the temperatures involved (DLC is stable up to 350°C) and provides a low friction and low wear surface finish which prevents particle and aerosol adhesion. The multilayer system exhibits excellent adhesion to the substrate and very good cracking resistance.



*Multilayer sequence of the DLC coating (section prepared by ball cratering)*

Coefficient of friction DLC-Steel:  $\mu=0.15$   
 Coefficient of friction DLC-DLC:  $\mu=0.10$

**Customer Benefits**

- Sulzer Innotec's low friction and low wear PVD DLC coating increased reliability and life time
- Adhesion of aerosols and particles to the surfaces was prevented
- Standard fabrication methods of the components could be retained, so no significant process re-engineering was required
- Customers needs were addressed flexibly and fast
- The Customer received a specific solution tailored by experts



*DLC-coated diluter body*