

ta-C Coating System

ta-C 涂层系统

DREVA 1050 LAM



Main Features

- Field proven, reliable and refined equipment concept
- Laser-ARC-Modul (LAM) for ta-C deposition optional with macroparticle filter
- ARC evaporation sources for base coatings
- Option: magnetrons for sputtering (planar and tubular), including HIPIMS
- Hollow cathode for plasma pre-treatment
- Segmented substrate heating unit
- Usable coating volume: \varnothing 1,050 mm x 1,100 mm
- High capacity combined with high productivity
- Adjustable substrate carrier: dedicated holding fixtures for various tool and component designs
- Fully automated control system and data logging

Applications

- ta-C deposition in combination with subsequent polishing step for tribological systems
- Macroparticle filtered ta-C deposition for thin layers on 2D & 3D substrates

Process Benefits

- Low friction coefficient of polished ta-C down to $\mu < 0.01$, supra lubricity verified
- Indentation acc. to ISO 14577: E-modulus 300 – 600 GPa / hardness 40 – 80 GPa
- ta-C layer properties: sp^3/sp^2 up to 80%, H-content < 0.1 at % (at detection limit of NRA)
- Thermal stability of layer properties in use: $< 400^\circ\text{C}$ ($\Delta < 750^\circ\text{F}$)
- Low deposition temperature: $< 180^\circ\text{C}$ ($\Delta < 360^\circ\text{F}$)
- Many substrate materials: steel, hard metals, Si, Al, Ti-alloys, glass, polymers
- Certified ta-C adhesion to substrate material in tribological applications
- Layer thickness: up to $30\ \mu\text{m}$ in use
- Thick ta-C coatings $> 3\ \mu\text{m}$ can be polished to achieve a very smooth surface
- Production proven & effective deposition rate on substrates: up to $1\ \mu\text{m}/\text{h}$ on surface area of about $8\ \text{m}^2$ per batch (macroparticle filtered ta-C deposition: up to $0.3\ \mu\text{m}/\text{h}$)

Customer Benefits

- Superior wear protection of up to $30\ \mu\text{m}$ thick ta-C layers with outstanding properties
- Deposition rate at the maximum physical limit shortens process time to a competitive advantage
- Production proven technology, equipment concept and layer properties

Range of Coatings:

- Standard layer stack: Cr / ta-C
- Optional base coatings: Cr, Ti, CrN, WC, other hard coatings on request

特性

- 经实践证明, 设备运行可靠、品质优良
- ta-C 沉积用 Laser-ARC-Modul (LAM), 另可配置多孔大粒子过滤器
- 基础涂层用电弧蒸发源
- 可选: 磁控溅射 (平面和管状), 包括 HiPIMS (高功率脉冲磁控溅射)
- 等离子体刻蚀用空心阴极
- 分段产品加热装置
- 有效涂层区域: $\varnothing 1,050 \text{ mm} \times 1,100 \text{ mm}$
- 高产能、高产率
- 可调节的产品转架系统: 专用夹紧装置, 满足不同刀具和零部件的设计需求
- 全自动控制系统和数据采集

用途

- ta-C 沉积与摩擦学系统的后续抛光步骤结合
- 经多孔大粒子过滤的 ta-C 沉积, 适用于 2D 和 3D 产品的薄涂层

工艺特点

- 打磨后的 ta-C 摩擦系数较低, $\mu < 0.01$, 其润滑性得到验证
- 压痕符合 ISO 14577 标准要求: 弹性模量 300-600 GPa / 硬度 40-80 GPa
- ta-C 层特性: sp^3/sp^2 可达 80%, H 含量小于 0.1 at % (NRA 的检出限)
- 涂层的热稳定性: $< 400^\circ\text{C}$ ($\Delta < 750^\circ\text{F}$)
- 低沉积温度: $< 180^\circ\text{C}$ ($\Delta < 360^\circ\text{F}$)
- 多种打底材质: 钢、硬质材料、Si、Al、Ti 合金、玻璃、聚合物
- 在摩擦应用中, ta-C 与基体材料的结合力得到验证
- 涂层厚度: 可达到 $30 \mu\text{m}$
- 可对超过 $3 \mu\text{m}$ 厚度的 ta-C 涂层进行打磨, 使其表面光滑
- 经生产实践验证的基体有效沉积率: 每批次大约 8 m^2 的表面上可达到 $1 \mu\text{m}/\text{h}$ (经多孔大粒子过滤的 ta-C 沉积: 达 $0.3 \mu\text{m}/\text{h}$)

客户利益

- $30 \mu\text{m}$ 厚的完整 ta-C 层具有优异的耐磨防护性
- 沉积率如能实现最大化, 可缩短加工时间, 使其优势更加突出
- 工艺技术、设备设计和涂层特性都经过生产实践验证

涂层类别

- 标准叠层: Cr / ta-C
- 其它可选用的打底层: Cr, Ti, CrN, WC, 如有要求可提供其它硬质涂层

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