

Poster-Session

Laser structuring and DLC coating of elastomers for high performance applications

Sönke Vogel¹, Andreas Brenner², Bernadette Schlüter³, Bernhard Blug⁴, Franziska Kirsch⁵ and Tamara van Roo⁶

¹Chair for Laser Technology LLT, RWTH Aachen University, Aachen; ²Fraunhofer Institute for Laser Technology, Aachen; ³ Fraunhofer Institute for Mechanics of Materials IWM, Freiburg; ⁴Fraunhofer Institute for Mechanics of Materials IWM, Freiburg; ⁵Fraunhofer Institute for Structural Durability and System Reliability LBF, Darmstadt; ⁶Fraunhofer Institute for Structural Durability and System Reliability LBF, Darmstadt

manuel.mee@iwm.fraunhofer.de

Even though hard, low friction coatings such as diamond like carbon (DLC) would be beneficial for the performance and longevity of rubber seals, a crucial challenge remains. The elastic mismatch of rubber substrate and DLC coating prevents a fracture free coating application. In this work, a nature inspired approach is applied to render the stiff coating flexible and resilient to delamination at the same time by direct laser structuring. Rubber substrates were laser structured with tile patterns and subsequently DLC-coated. Tensile and tribology tests were performed on structured and unstructured samples. Unstructured DLC-coatings showed a crack pattern induced by the coating process, which was further fragmented by tensile stress. Coatings with tile patterns did not experience a further fragmentation under load. During continuous tribological loading, less heterogenous damage is produced for tile structured samples. The findings are ascribed to the relief of induced coating stress by the tile structure, meaning a more resilient coating.