

POC004

XPS, ATR-FTIR and friction studies on modifications of polydimethylsiloxane after exposure to argon-oxygen plasma and UV radiation at 172 nm, 185 nm and 245 nm

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The biocompatibility of polydimethylsiloxane (PDMS) makes this polymer a valuable material for various medical applications. To modify the surface properties of PDMS plasma or UV radiation are frequently used. While there are several studies investigating the physicochemical changes after surface treatments [1-3], currently there are no studies comparing the treatments or documenting the tribological properties. In this study the modifications of PDMS by an atmospheric pressure argon-oxygen plasma and UV radiation at 172 nm, 185 nm and 245 nm have been compared. The surface has been analysed with X-ray photoelectron and ATR-FTIR spectroscopy. Friction tests have been conducted to evaluate the differences in the tribological properties after the treatment. It was observed that UV treatment with 172 nm and 185 nm radiation for time periods above 5 min produced SiO_x films reaching to greater depths and with a higher proportion of hydroxyl groups than with a plasma treatment. On the other hand, a plasma treatment produced films with a stoichiometry closer to SiO_2 . Furthermore it was noted that UV radiation at 254 nm had little effect on the chemical structure of the material. The friction coefficient decreased significantly after exposing the specimens to 172 nm radiation and noticeably for 185 nm. After plasma or 245 nm radiation exposure, the friction coefficient exhibited a comparably small decrease. Exposures to UV radiation at 172 nm and 185 nm for a time period of 1 min produced surfaces with an increased friction coefficient compared to reference measurements.

The financial support by the German Federal Ministry of Education and Research is gratefully acknowledged.

References

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Keywords

UV
polydimethylsiloxane
dielectric barrier discharge