Influence of film thickness and deposition rate on surface quality of polyparylene coatings

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Polyparylene is a polymer with outstanding properties when compared to other synthetics. Therefore, chemical vapor deposition of polyparylene is making inroads in several technical fields. Even applications demanding tight requirements on coating quality, like gate dielectrics for the semiconductor industry and semipermeable layers for drug eluting implants in medical science, are coming within its purview. In this paper, the impact of film thickness and deposition rate of the polyparylene CVD process on surface parameters like roughness and pinhole density is investigated. Surface roughness and pinhole density were monitored by atomic force microscopy (AFM) measurement. Furthermore, the influence of the pinhole density on tunneling current and breakdown voltage of the deposited layers is also investigated. The results obtained are used to establish an easy method to estimate the pinhole density by electrical measurement rather than the AFM method, which is not only time consuming but also limited to small flat areas. To deposit very thin layers below a thickness of 1 μm, conventional coating techniques for polyparylene have been replaced by a completely new method that features a steep slew rate for the deposition rate. The new coating method is superior to the well-known Gorham method with respect to the temperature dependent deposition rate, which makes the coating of very thin layers impossible.
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