Novel polyetherimide (PEI) sliding lacquers with chemical bonded PTFE as lubricant

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Polytetrafluoroethylene (PTFE) is industrially used as a solid lubricant in antifriction coatings for a long time. However, virgin PTFE is not compatible to almost all plastic materials resulting in drawbacks in terms of PTFE distribution and breaking down behavior affecting the performance of final dispersion and film quality. PEI as a high-performance polymer exhibits highly dielectric strength and inherently flame resistance on one hand but low friction coefficient on the other hand. The goal was to compare several approaches for improved compatibility between the matrix and PTFE as lubricant to get better dispersion, enhanced mechanical and tribological film properties.

Therefore, two strategies to achieve polyetherimide (PEI) antifriction coatings with chemical bonded (cb) PTFE as a solid lubricant were studied. The lacquers were kept either by reactive dispersion or reactive extrusion with subsequent dispersion. The resulting lacquers were tested with regard to their dispersion properties, the bonding degree and film characteristics. Initial tribological testing was carried out after curing at 225 °C by 60 min.

It was demonstrated that chemical bonding between PEI and PTFE results in more stable dispersions without adding of any dispersion agent. Furthermore, the resulting particle size is much lower than in physical mixtures with original PTFE powder resulting in more homogeneous films. In addition, chemically bonded PTFE acts as a toughening modifier in the matrix.

Initial tribological testing illustrated that the coefficient of friction is almost the same for all variations. However, the specific wear rate in the case of chemical bonded PEI-PTFE-films is much lower than for the physical mixed systems.

Keywords: Polyetherimide (PEI)-PTFE-cb antifriction coatings, chemical bonded (cb) lubricant, dispersion properties, mechanical properties, tribological film properties.

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