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Effect of Temperature on Tribological Performance of Polyetheretherketone-Polybenzimidazole blend

Annelise Jean-Fulcrand¹, Marc A. Masen¹, Tim Bremner², and Janet S. S. Wong^{1}*

¹The Tribology Group, Department of Mechanical Engineering, Imperial College London, Exhibition Road, London, United Kingdom SW7 2AZ

²Hoerbiger Corporation of America Inc., Houston, Texas, USA

*Corresponding author: j.wong@imperial.ac.uk

All data and results are available upon requests by email to the corresponding author or tribology@imperial.ac.uk

ABSTRACT: Polyetheretherketone (PEEK) is one of the most commonly used High Performance Polymers (HPP) although its high temperature performance is poor. In this study, polybenzimidazole (PBI), a HPP with one of the highest glass transition temperatures currently available, is blended to PEEK to form a 50:50 blend (TU60). Tribological performance of the blend (TU60) was investigated by rubbing it against steel at temperatures up to 280°C. Results obtained are compared to those from neat PEEK and neat PBI. All three polymers were thermally stable during the duration of tests. However chemical analysis on polymeric transfer layers on steel surfaces and polymer debris suggest polymer degradation. The degradation observed is shear-assisted, possibly promoted by shear heating. Indeed the estimated interfacial temperature based on Jaeger model was above the melting point of PEEK in some cases. TU60 outperforms PEEK in all test conditions and PBI at 280°C. TU60 formed the transfer layers on steel similar to that of PEEK. When contact temperature is closed to the meeting point of PEEK, PEEK in the TU60 creates a low strength transfer layer which acts as an interfacial lubricant. This reduces friction which in turn reduces PBI degradation in TU60 at high temperature. This work provides a strategy for creating interfacial layers to improve polymer tribological performance while maintaining the integrity of the polymer.

KEYWORDS: tribology, high performance polymers, polymer blends, transfer layer, friction

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