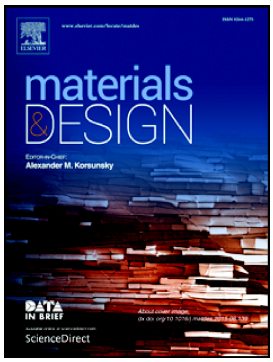
Accepted Manuscript



Effects of biphenyl groups on the dry sliding behavior of poly (ether-ether-ketone-ketone) copolymers against stainless steel

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PII: S0264-1275(18)30603-8
DOI: doi:10.1016/j.matdes.2018.07.063
Reference: JMADE 7296

To appear in: *Materials & Design*

Received date: 5 June 2018
Revised date: 29 July 2018
Accepted date: 30 July 2018

Please cite this article as: Bo Jiang, Daye Sun, Ye Zhu, Yongpeng Wang, Yingshuang Shang, Haibo Zhang , Effects of biphenyl groups on the dry sliding behavior of poly (ether-ether-ketone-ketone) copolymers against stainless steel. Jmade (2018), doi:10.1016/j.matdes.2018.07.063

Effects of biphenyl groups on the dry sliding behavior of poly (ether-ether-ketone-ketone) copolymers against stainless steel

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Abstract

In this paper, an experimental study was decided to investigate the dependence of tribological property on biphenyl group contents in the polymer chain. A series of biphenyl containing poly (ether-ether-ketone-ketone) copolymers were synthesized by nucleophilic substitution polycondencation, the contents of biphenyl units were controlled by the feed ratio of biphenol to hydroquinone. The sliding wear and friction tests were conducted using a pin-on-disc apparatus against a stainless steel counterpart without any lubricant under dry conditions. The results indicated the friction coefficient decreased with the growing biphenyl contents first and then increased after BP60, associated with the same change of polymer crystallinity, while the specific wear rate exhibited a negative correlation. It was demonstrated that this bridge between polymer structure, crystallinity, and tribological performance was independent of the test conditions. For one specific sample, raising applied load and sliding speed will aggravate the wear work, while the friction coefficient was only distinctly affected by the applied load, having no concern with the sliding speed. Probable mechanisms were discussed by observation of the worn surface using scanning electron microscopy. Within our efforts, a possible molecular design method was proposed to develop potential tribological resins via adjusting one specific group in the backbone.