46th Leeds-Lyon Symposium on Tribology - September 2-4, 2019, Lyon, France

Effect of ILs' chemistry on their lubrication mechanism under various sliding distances

Waleed Al-Sallami[1],*, Pourya Parsaeian[1], Abdel Dorgham[1], Anne Neville[1]

*waleedalsallami@gmail.com

[1]School of Mechnical Engineering, University of Leeds, UK

KEYWORDS

Keyword list 1; Friction; keyword list 2: Wear, free keyword: Ionic Liquids lubricant, tribofilm.

ABSTRACT

Using Ionic Liquids (ILs) as potential lubricant is limited in two applications; aerospace and in the lubrication of Electro Mechanical Machines Systems (MEMS) due their high cost [1-4]. In order to simulate the lubrication of MEMS; a micro scale study is conducted to investigate the effect of ILs' chemistry on their lubrication mechanism at various sliding distances. Five ILs are employed to cover the effect of cation chain length, anion chain length, cation type and anion type. Ball on plate configuration is utilized using Nanotribometer (NTR). The quantification of wear volume and surface morphology are characterized using white light interferometry. Surface chemistry is characterized using XPS. The results showed that ILs' chemistry is crucial in the determination of their lubrication mechanism. The increase of anion/cation chain length enhances the tribological behaviour of the lubricated surfaces. The influence of anion/cation type strongly is varied with the variation of sliding distance. In addition, for all ILs, the increase of sliding distance from 3.6 m to 14.4 m increases friction coefficient and initiates wear. Further increasing in sliding to 36 results either an increasing or decreasing in the friction and wear coefficients depending on the utilized IL.

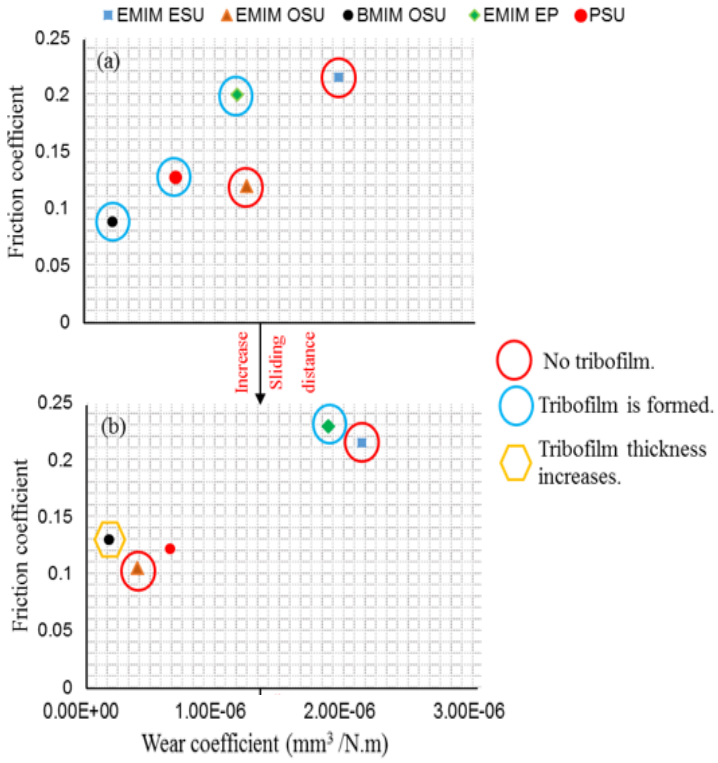

Fig.1 : The lubrication mechanism of ILs at various sliding distances.

ACKNOWLEDGMENTS

This project is funded by the University of Leeds, UK.

REFERENCES

[1] I. Minami, "Ionic liquids in tribology," *Molecules,* vol. 14, pp. 2286-2305, 2009.

[2] A. E. Somers, P. C. Howlett, D. R. MacFarlane, and M. Forsyth, "A review of ionic liquid lubricants," *Lubricants,* vol. 1, pp. 3-21, 2013.

[3] M. Palacio and B. Bhushan, "A review of ionic liquids for green molecular lubrication in nanotechnology," *Tribology Letters,* vol. 40, pp. 247-268, 2010.

[4] Y. Zhou and J. Qu, "Ionic Liquids as Lubricant Additives – a Review," *ACS Applied Materials & Interfaces,* 2016/12/28 2016.