CONTACT AND FRICTION BEHAVIOR ON SOFT-HARD CONTACT INTERFACE UNDER MECHANICAL STRESS CONDITIONS

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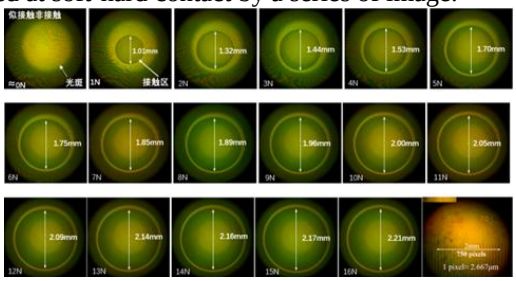
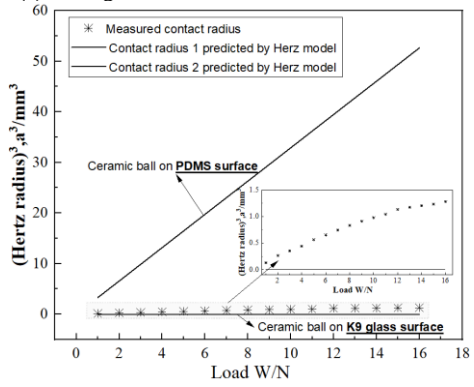
Keyword: Contact and adhesion; Friction; Experiments in tribology, soft contact tribology

ABSTRACT

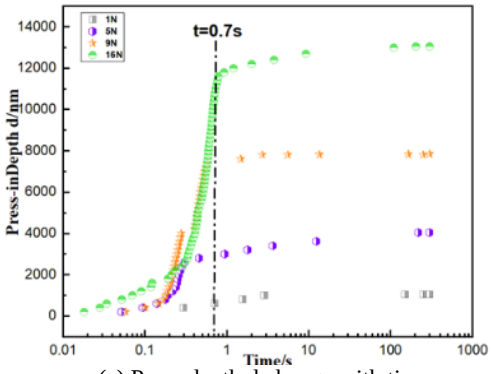
A homemade optical interferometry system for soft contact surfaces has been developed to carry out experimental studies of contact deformation under mechanical stress by in-situ observation. A ceramic ball was chosen as the rigid indenter, and a glass disc coated with a layer of PDMS film served as a pliable soft pair and optical viewing window. Interfacial dynamic contact processes were observed in situ during mechanical stressing with large deformations of the PDMS film surface, and both contact diameter with micrometer resolution and indentation depth with nanometer resolution were measured at soft-hard contact by a series of image.



(a) Image of contact zone recorded at 1-16N



(b) Contact radius a3 measured and predicted vs load



(c) Press depth d change with time

Fig.1 Results of contact zone deformation

The friction behavior was also investigated at unidirectional rotating motion with SRR=0.3 lubricated by water, the lubrication enhancement was observed by grafting polymer brush on PDMS surface.

The results are expected to contribute to the understanding of the complex contact mechanical behavior and tribological mechanisms of soft-hard interfaces subjected to mechanical forces for the development of biomimetic materials with excellent mechanical load-bearing and lubrication properties.

ACKNOWLEDGMENTS

The project was supported by the Science Fund of Shandong Laboratory of Yantai Advanced Materials and Green Manufacturing(GM2021A02) and. the National Natural Science Foundation of China(22032006, 51775287).

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