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Plasma surface interaction in hot filament cathode arc discharge used to nitride steel substrates R.P. DAHIYA, O. SINGH, V. AGGARWAL, Centre for Energy Studies, Indian Institute of Technology Delhi, New Delhi - 110016, India, H.K. MALIK, Department of Physics, Indian Institute of Technology Delhi, New Delhi - 110016, India, NISHA KUMARI, DBCR University of Science and Technology, Murthal -131039, India — Plasma-assisted nitriding process is a well developed technique for increasing the surface hardness. The process is energy efficient, environment friendly and versatile to treat samples of various shapes and sizes. Though the use of this process in industry is established, there are several scientific questions in the basic understanding of the migration of ions, electrons and radicals and plasma surface interaction. We have studied these processes in an experimental system developed with hot cathode arc discharge plasma. A mixture of nitrogen and hydrogen is utilized for plasma generation. Negatively biased steel substrate is nitrided in this plasma. The hot cathode arc discharge plasma source is utilized to independently monitor and optimise the plasma and the work piece parameters. Substrate bias and temperature, which are the important parameters for achieving the desirable surface hardness, are regulated. Hardness depth profile and nitrogen content in the hardened sample are also measured. Transport and diffusion of ions, electrons, radicals and neutrals are considered to explain the results.

R.P. Dahiya
Centre for Energy Studies, Indian Institute of Technology Delhi,
New Delhi - 110016, India

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