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Charge transfer in surface barrier discharge on μ sec to msec time scales SERGEY LEONOV, IGOR ADAMOVICH, VITALY PETRISHCHEV, The Ohio State University, OSU TEAM — The paper presents experimental results characterizing dynamics of development and kinetics of energy coupling in surface dielectric barrier discharge (SDBD), sustained over dielectric and weakly conducting liquid surfaces, over a wide range of time scales and electrical conductivities. Time-resolved discharge development and mechanisms of coupling with quiescent air are analyzed using nanosecond gate camera imaging, high-sensitivity time-resolved schlieren imaging, surface charge sensor, and Laser Differential Interferometry. It is shown that NS SDBD plasmas generate high-amplitude, broadband, stochastic, point-wise, near-surface perturbations on a long time scale (>100 μs) after the discharge pulse. These perturbations are caused by discharge contraction and originate from the ends of individual streamers where they attach to the surface. It is also demonstrated a significant increase of energy (surface charge) stored on the dielectric surface during the NS discharge pulse, which in this case greatly exceeds energy dissipated as Joule heat (up to a few hundred percent). The present results strongly suggest that surface charge accumulation, along with use of alternating polarity pulse waveform, may significantly improve performance of surface discharge plasma actuators.

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