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Energetics of reactions in a dielectric barrier discharge with argon carrier gas: Halocarbons SEAN WATSON, Polytechnique Montreal, BERNARD NISOL, Ghent University, STEPHAN REUTER, MICHAEL R. WERTHEIMER, Polytechnique Montreal — The novel method we developed for understanding energy exchanges between argon (Ar) carrier gas and precursor molecules in a large-area $216\,cm^2$ dielectric barrier discharge (DBD) reactor has resulted in a series of articles, each relating to a different family of organic compounds. This communication focuses on two new groups, perfluorocarbons, C_xF_y and perchlorocarbons, C_xCl_y, and compares results with earlier ones for hydrocarbons, C_xH_y[1] and hydrofluoromethanes, CH_xF_y[2]. The precursors (in $^o/_{oo}$ concentrations) were mixed with Ar in a 20 kHz, 8 kV (peak to peak) DBD. For each separate compound E_m, the energy (in eV) absorbed per molecule, was determined from measurements of the time resolved discharge current, I_d, and the gap voltage, V_{gap}. Optical emission spectra were recorded and E_m was plotted as a function of precursor flow rate, F_d. The process generally led to thin plasma polymer (PP) deposits (e.g. on Si wafer substrates). Their characteristics, like their C/F or C/Cl composition ratios from XPS measurements, strongly correlated with E_m and F_d, as did PP deposition rates and water contact angles. [1] B. Nisol et al., Plasma Process Polym, 2016;14:e201600191 [2] S. Watson et al., Plasma Process Polym, 2020;17:e201900125.

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