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Nonequilibrium Plasma Assisted Dissociation of Hydrogen Sulfide KIRILL GUTSOL, TOMAS NUNNALLY, ALEXANDER RABINOVICH, ANDREY STARIKOVSKIY, ALEXANDER FRIDMAN, ALEXANDER GUTSOL, ABDENOUR KEMOUN, DREXEL UNIVERSITY TEAM, CHEVRON ENERGY TECHNOLOGY COMPANY TEAM — H_2S is a byproduct of oil refinement and comprises a significant portion of natural gas deposits. Therefore, efficient H_2S treatment and utilization are crucial to the oil and gas industry. The dissociation energy of H_2S into hydrogen and sulfur is only 0.2 eV/molecule, which can make a H_2S a much less energy consuming source of hydrogen than water (2.5 eV/molecule). Such prospects are particularly important for oil industry, which consumes large amounts of hydrogen in oil hydro-desulfurization for production of low sulfur fuels and could benefit from a low cost method of H_2S dissociation. The experiments in corona, DBD, spark, and low-current arc discharges showed that: H_2S dissociation in plasma is not a chain reaction, so that H and HS radicals created by the plasma do not cause chain reactions at low temperatures. The low temperature discharges with high reduced electric field and low current produce results characterized by the common specific energy requirement (SER) higher than 10 eV/molecule, which corresponds to direct dissociation by electronic impact. The results obtained in arc filament discharge at low reduced electric field have SER $\sim$2.5 eV/molecule, and is close to thermodynamic equilibrium.

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