

**A DEPOLARIZATION BASED OPTICAL SCATTERING TECHNIQUE
TO MEASURE THE ONSET OF THE EARLY AGGLOMERATION
OF FLAME-GENERATED NANO-SIZE SOOT PARTICLES**

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ABSTRACT. Soot particles generated in hydrocarbon flames are investigated by a depolarization-based laser light scattering technique. The contribution of co-polarized and cross-polarized scattered light for vertical and horizontal linear polarization states of the incident laser light at 514.5 nm are measured at variable polar angles θ . It is observed that: (1) The vertical depolarization ratio ρ_v measured against the scattering angle is very low and flat in the case of smaller chain-like aggregates (fractal dimension $D_f \approx 1.3$), whereas, in the case of larger branched-chain aggregates ($D_f \approx 1.7$), ρ_v exhibits a maximum at about 90° . (2) In contrast to the reciprocity theorem, the measured ratio I_{HV} / I_{VH} is found to be different from unity when the first sticking of the primary particles occurs. These results suggest that the measurement of the reciprocity ratio I_{HV} / I_{VH} is a powerful and reliable tool to establish the onset of the early aggregation mechanism between nano-size soot particles formed in a flame.