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Observation of molecular alignment by impulsively excited rotational wavepacket in O_2 and N_2 using scattered probe pulse SIMA HOSSEINI, ALI AZARM, SEE LEANG CHIN, Center for Optics, Photonics and Laser (COPL), Laval University — We report a new optical technique to observe molecular alignment and periodic recurrences after impulsively exciting rotational wave packet, experimentally. The nonadiabatic laser-induced molecular alignment in a gaseous medium has been previously established. In the new current method, we collected the Rayleigh scattering of a weak probe pulse (400 nm/18 μJ/$\sim$ 50 fs) in the direction at right angle to the propagation direction of the filament in either oxygen or nitrogen induced by a pump pulse (800 nm/0.9 mJ/ 42 fs). The aligned molecules in the filament would induce time dependent spectral modulation in the probe pulse. We measured the wavelength modulation of the elastically scattered probe pulse and obtained information of the alignment and revivals. Using this method we found the rotational revival period of N_2 and O_2. Moreover, we could measure the rotational constants of these gases in excellent agreement with those reported in the literature. This method has a potential application in filament remote sensing in the atmosphere to detect and identify molecular pollutants in the back scattered direction. Specially, this technique is a key to distinguish pollutants which their excited fragments inside the filament have the same fluorescence spectra.

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