very rapidly, from near zero to a value close to its maximum, at a time near the onset of detectable light scattering.

The comparison between the absorption and scattering observations near this time is very interesting. For the toluene–argon shock illustrated in figure 3, the light-scattering measurements indicate that substantial conversion of (gas-phase) hydrocarbon molecules and/or radicals into soot occurred near $t = 0.91$ ms (figure 3*c*). However, there is no discontinuity whatsoever in the optical absorption at or near this time. As shown in figure 3*b*, the rate of increase in absorbance at 488 nm is almost constant during the period that the bulk of the conversion from gaseous species into soot particles occurs. This rather surprising result demonstrates the power of scattering measurements in aiding the interpretation of more conventional optical measurements.

In contrast to the well-defined induction period exhibited in the scattering experiments, no such induction period is found for the onset of light absorption. However, an approximate induction period can be defined in terms of the variation in optical dispersion, for this approaches its limiting value only after a substantial delay. For shock no. 184 (figure 3*a*) the ratio of the absorbances at 488 and 632.8 nm falls to 1.56 (within 15 % of its limiting value of 1.36) after 1.1 ms which is only slightly greater than the light-scattering induction time (0.91 ms).

(*c*) *Qualitative features of individual shock records over the temperature range* 1600–2300 K

For $[C]_{total} = 2 \times 10^{17}$ atoms/cm^3, each of the shock records fall naturally into one of four types, *a*, *b*, *c* and *d*, depending almost entirely on the shock temperature and very little on the identity of the aromatic species. Significantly both the kind of information which can be obtained from a given shock record and the certainty of its interpretation depend on the type to which it belongs.

(i) *Type 'a' shocks*: *temperature* < 1650 K

Important features of type '*a*' shocks are that the absorbances at 488 nm and 632.8 nm, and their ratio, are all increasing at the end of the shock flows, as illustrated in figure 5 for an ethylbenzene–argon shock (no. 191) at 1600 K. Because the absorbance at 488 nm is increasing at $t = 2.5$ ms, its value here is a measure of the rate of the reaction sequence culminating in the formation of soot particles, rather than of a limiting extent of conversion into soot or some other product. For some shocks the rate of increase in absorbance at $t = 2.5$ ms is larger than its mean rate of increase during the flow, and for others it is smaller than the mean, so that the pattern in the results obtained would be different if a longer or shorter time than 2.5 ms had been chosen.

(ii) *Type 'b' shocks*: *temperature in the range* 1700–1850 K

Typically, for shocks of this type the absorbances at 488 nm and 632.8 nm, and their ratio, have all reached a plateau well before the end of the available flow time,