

Smoke gets in my eyes

The visible particulate matter in smoke—from such sources as cigarettes, cars, and forest fires—is most commonly composed of carbon particles, or soot, with typical sizes of $0.1\text{--}1\text{ }\mu\text{m}$. The particles are initially advected, carried along by the bulk air flow. As the flow dissipates, the soot particles undergo diffusive motion.

The initial, advective flow follows streamtubes. Streamtubes are bundles of streamlines, and because streamlines never cross,

streamtubes are impermeable. Therefore, the soot particles are initially trapped in an intricate two-dimensional filigree that displays nested tubes and recursive folds, as seen here.

At later times, the soot particles begin to diffuse out of the streamtubes, and the structure becomes lost to an increasingly uniform density of particles. (Photo submitted by Andrew Resnick, Cleveland State University.)

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