



This image was taken with transmitted off-crossed circular polarized light and darkfield reflected illumination. The sample is a tapelift from a municipal truck maintenance shop. This assemblage indicates diesel trucks, humans, high speed abrasive grinding of iron, wood block spacers and an open air ventilation system; all consistent with a truck maintenance shop. In an office impacted by this source the particles would be more dispersed, perhaps smaller, and mixed with other assemblages, such as the office assemblage, road assemblage, natural background assemblage, and others.

1. Tire Wear: Tire wear consists of a transparent matrix filled with carbon black and various mineral fillers. It is opaque because it absorbs light very efficiently, whether it is transmitted or reflected illumination. As a result it still appears very dark with reflected light. The edges are poorly defined because they are very irregular and the thinnest parts transmit light. The mineral grains added to the elastomer are most evident near the edges and can be seen as bright areas, some very small. Tire wear is often in the shape of a tapered cylinder but may be more equant as is the case with the unlabeled tire wear particle to the right of object #4. The length to width aspect ratio increases as the amount of natural rubber increases in the tire. Truck tires contain more natural rubber than car tires and so will generate longer tapered cylinders. Jitney tires have even more natural rubber and can generate very long tapered cylinders. They are often seen in warehouse samples where jitneys are used to move materials on smooth floors.

2. **Emery Abrasive:** Emery abrasive is angular in shape, colorless, has relatively high refractive indices, and has a low birefringence. The absence of any weathering or cementing minerals helps differentiate the grain from a naturally occurring mineral grain. These are emery abrasive particles but they are over exposed in this image.
3. **Skin Flake:** This is a skin flake showing some stress birefringence. It is over exposed in this image but the polygonal shape typical of a human skin flake is still evident.
4. **Fern Spore:** Fern spores are often coated with a loose, crinkled perisporium. Inside this envelop is the kidney shaped spore itself. Fern spores are isotropic and tend to be yellow to tan in color. With the perisporium they are often about 50 micrometers in length. The kidney shaped spore is typically around 35 micrometers in length.
5. **Wood Fragment:** A wood fragment is a piece of wood that has generally broken along the grain of the wood and still contains all of its lignin, giving it a brownish color. Sawdust differs in that it consists of shattered, jagged, multiple cellular units or fragments of cells broken away from the parent cell. Paper fiber fragments have had the lignin removed so they consist of elongated sections of single cells and still contain intact lumens over the length of the fragment.
6. **Cenospheres:** Cenospheres are carbon residues of liquid fuel droplets. They are formed by droplets of liquid fuel that are incompletely burned due to insufficient oxygen. Diesel engines are a common source though Bunker C oil fired boilers on ships are a common source in seaports. They tend to be frothy or even lacy due to the out gassing of volatile compounds as the hydrogen is being burned away from the hydrocarbon fuel. Cenospheres are a form of graphene and as such are about 7% reflective. Because of the complex geometry of the surface the result is a field of highlights rather than a discrete reflection of the light source. There are three examples of cenospheres in this image.
7. **Magnetite Sphere:** Magnetite spheres are created by welding, high speed grinding or torch cutting of iron or iron alloys. They are black, opaque spheres with a fine surface crystalline pattern that is relatively high in reflectivity, about 10%. The relatively smooth surface reflects a reasonable facsimile of the light source, a ring in the case of reflected darkfield illumination. With transmitted cross polarized light a bright narrow ring of depolarized light appears around the edge of the particle.