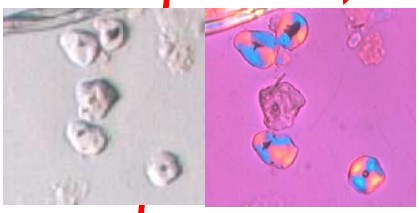
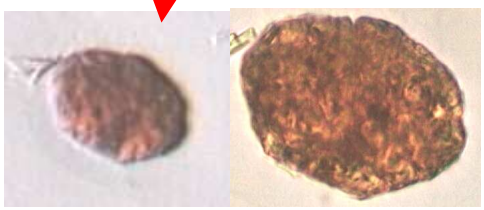
WHAT ARE THEY?





(Nylon explained on next page)

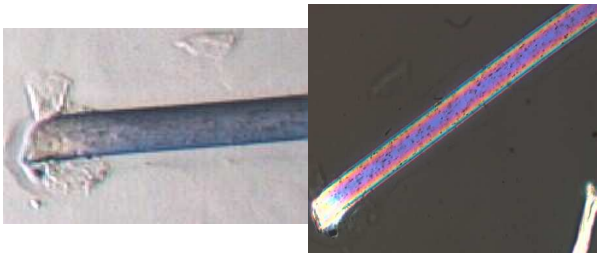
This field of view was photographed at 100X using transmitted oblique illumination. This was the second in the series of photographs that documented the appearance of particles with different types of illumination. The smaller photographs are first a blow-up of the 100X image and then a 400X image to feature specific characteristics.

Particles are identified by their optical characteristics. The most prominent particle in this photograph is the large cotton fiber running from top to bottom. Cotton is identified by its helical twisting, collapsed central channel (lumen), anisotropy, RI greater than the mounting medium, and absence of extinction position. Cotton fiber is often dyed though in this case it is not. These properties are sufficient to uniquely identify mature cotton fiber that has not been mercerized. Cotton is generally included in the "Clothing Fiber" category.

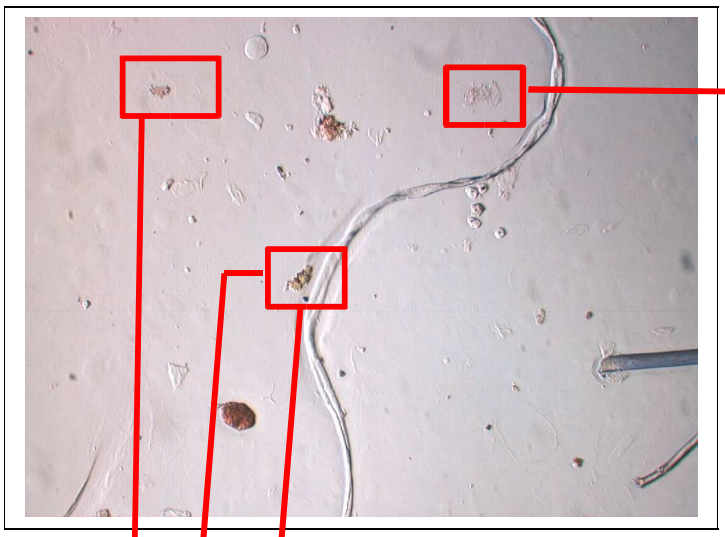
There are a number of "Starch" grains in this photograph, most are smaller than those in this clump of four (center grain is a skin flake). These particles are corn starch grains. They are identified by the central trilete scar in most of them, their polyhedral tendency, their moderate anisotropy, the radial orientation of their high refractive index, size range, good transparency, and lack of color. They can be dyed or may turn brown on heating in the absence of water. If heated with water they swell and become isotropic.

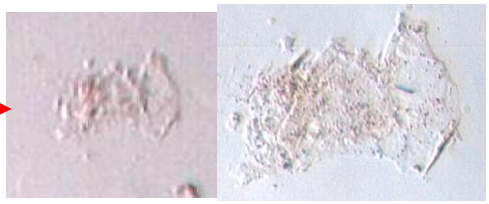
Mite fecal pellets are common in homes with a significant mite population. The pellets are sometimes more mobile in the home environment than are the mites. The pellets are identified by their rounded shape, general size, brownish color, randomly oriented crystalline inclusion with moderate anisotropy, isotropic matrix, surface texture, and

heterogeneous inclusions. The recent diet of the mites is often evident by the materials seen in the pellet. Mite parts will be found associated with the samples from this environment. These would be included in the category of "Mite Debris".

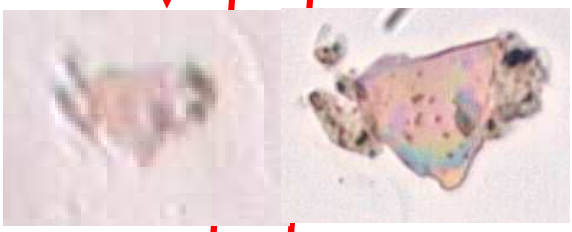


This is a blue nylon "Clothing Fiber" that has been mechanically broken, which creates high molecular stress at that end. The fiber has no cuticle, cortex or medulla (hair), no lumen (plant), and not long fibril bundle structure (mineral fiber). It is filled with high refractive index particles that strongly back-scatter light, they appear dark with transmitted light and white with reflected light. The fiber has parallel extinction and high moderate birefringence so it is dark between polarizing filters when it is oriented in the E-W or N-S position but is bright, showing many colors at 45°. The higher refractive index is oriented along the length of the fiber and both refractive indices are much higher than the mounting medium.





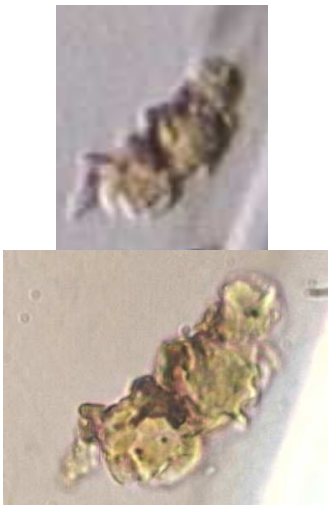
Human "Skin Flakes" are sometimes associated with attached cosmetic materials. This skin flake is associated with red iron oxide pigment. Human skin flakes are broad, thin, colorless (all races), irregular outline, tapered edge, structures with very low stress birefringence, and good scattering texture with darkfield illumination.



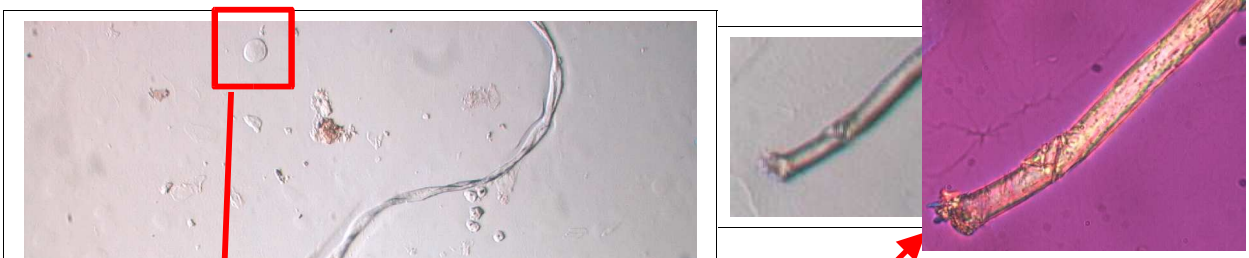
This is a flake of pearlescence used in some cosmetics and inks. This is a synthetic flake material designed to be high reflective, bright in reflected darkfield. It is transparent and isotropic and exhibits thin film interference colors when viewed with transmitted light. It is often associated with other cosmetic pigments and debris. This would be included in the "Cosmetics" category.

(Soot and Chlorophyll explained on next page)

Soot is opaque with transmitted light and black with reflected light. It is a product of pyrolysis and may exhibit a variety of distinctive structures or associated features. This is a fairly large soot particle with some reflectivity off the center of the lower, rounded part. That indicates a surface tension formed shape that can only be formed with a liquid fuel. Its irregular shape would tend to indicate a viscose, poorly aerosolized fuel. An uncontrolled burning of plastics or a heavy fuel (Bunker C or residuum) oil fired boiler can produce this type of particle but a diesel engine will generally not. The range of variation in other soot particles will indicate the dominant pyrolysis sources. This would be in the "Soot" category unless sufficient other particles were found to identify a more specific source.



Chlorophyll colored particles indicate algae or plant residues. This particle is a combination of degraded plant material (brown) and the chlorophyll filled algae cells. This particle is isotropic except for a few very small mineral grain attached and is cellular in structure. It is from the outside environment and is part of the track-in or air exchange loading in the indoor environment. Examination of other particles will help establish the balance of track-in and air exchange burden. This is normally included in the "Algae" or "Humus" category, depending on how frequently algae particles are encountered in the sample.

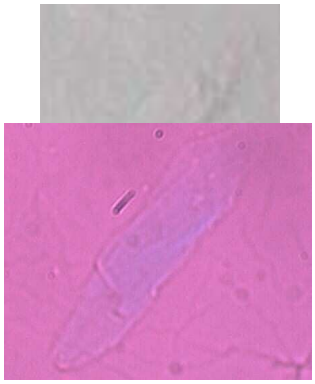


This is a mechanically broken polyester fiber. The refractive index across the fiber is near the refractive index of the mounting medium (1.48). The refractive index along the length is very much higher and the particle has a birefringence that is very high. It has some rutile filling (little black specks with transmitted light). This is normally included in the "Clothing Fiber" category.

This is a mechanically degraded fibril bundle from a cellulose fiber. It is a thin ribbon with the high refractive index oriented along the long axis. Its refractive indices are well above the mounting medium but its so thin that it can be difficult to see without oblique illumination and polarized light. It is commonly associated with tissue paper use or frequently laundered cotton fiber cloth. Bedrooms, sickrooms, and hospitals show a significant amount of this type of particle. This is usually included in the "Paper Fiber" category.

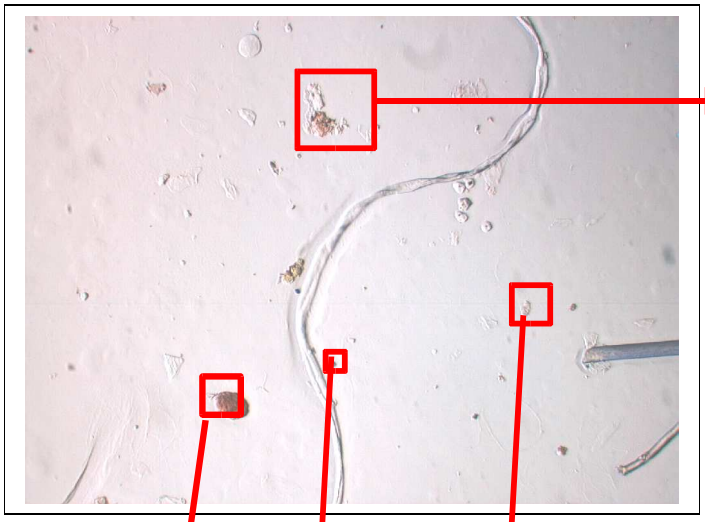
(**Fur** explained on next page)

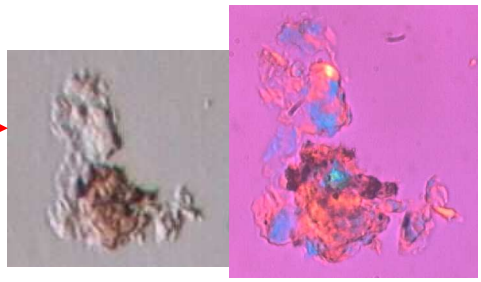
This type of particle reached the surface as a liquid with a significant soluble solid content. The solid is isotropic, non-crystalline, colorless, has a refractive index moderately higher than the mounting medium, made the liquid viscose at relatively low concentration, and was formed with significant energy or was at very low concentration when formed. The most common source for this type of particle in areas occupied by humans is the mucoid aerosols from the mouth or nose. This is normally included with the "Skin Flakes"



category as part of the human generated population of particles.

The fur on most pets results in a rather distinctive structure for their dander. It tends to form thin, elongated flakes that have a higher birefringence than human skin flakes. Chemically skin flakes from different mammals and even the hair is the same, keratin, but the morphology and the forming forces active in their release are different and leave distinctive marks. This is a typical particle that would be included in the category "Pet Dander".





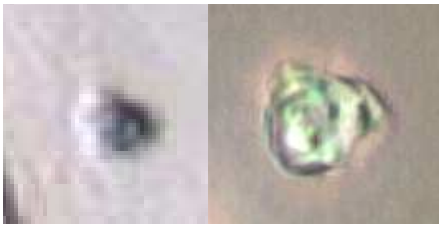
"Humus" particles are predominantly brown in color but may have colorless region also. They often contain optically active materials in random orientation and are heterogeneous, though well integrated, in composition. Their refractive indices are all moderately above the mounting medium. These materials can be from a variety of sources but are typically from outdoors when they have associated mineral grains within the matrix.

(Particle explained on next page)

(Natural Minerals explained on next page)

(Soil explained on next page)

This particle has a distinctive structure of reinforcing ridges attached to a thin plate of the same material. Its refractive indices are moderately higher than the mounting medium and its birefringence is very low. This is characteristic of the chitin exoskeleton of insects and arachnids. This is normally included in the "Insect Parts" category.



"Natural Minerals" include a wide variety of optical properties. The mineral here is a green amphibole with magnetite inclusions. Natural minerals are not generally identified specifically in the report unless they are important from a health aspect. Naturally occurring asbestos fiber would be an example of a mineral that would be specifically identified.

The "Soil" category includes agglomerated fine minerals with clay binder that may or may not have a significant organic component. Some organic component or staining is required to be included as a soil. This particle is a cemented clay with a few bright mineral crystals and a significant transmitted light scatter. If a single mineral crystal dominates the sample and the organic component is not obvious then the particle is included with the natural minerals.