

GLASS EVIDENCE

Glass is considered microscopic evidence



Glass has many properties

- It is composed of SAND (silicon oxides)
- SODA (sodium carbonate)
- LIME (calcium oxide)
- HARD
- BRITTLE
- AMORPHOUS random arrangement
- Not a crystalline substance (like diamond)
- Glass is a liquid with high viscosity



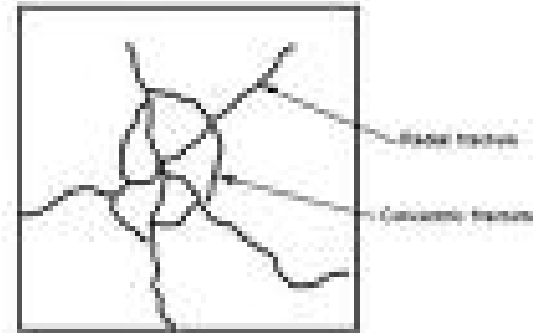
Broken Glass



Where is the glass?



Primary fracture= radial (lines extend outward)
Secondary fracture= concentric (circular- around
the point of impact)



AUTO GLASS

Tempered glass

Annealed glass

Breaks but does not shatter

Used in rear and side windows

Glass to which strength is added by introducing stress through rapid heating and cooling of the surfaces.

**STRONGER THAN
REGULAR GLASS**



Windshield Glass

Laminated glass

- Two sheets of ordinary glass bonded together with a plastic film between sheets

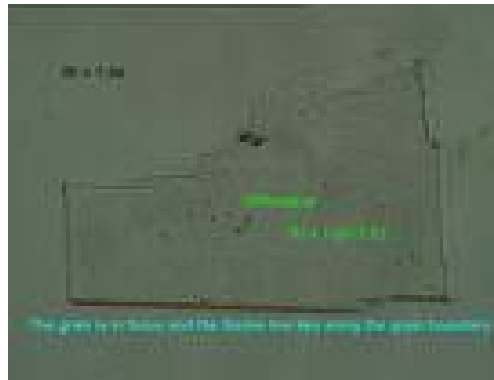


Bullet-proof glass aka Bullet-resistant glass

- A thicker version of laminated glass
- Armored cars have a thickness of 2.8-3 inches
- Armored Hummers (war) have thickness of 4-5 inches
- **VERY HEAVY**

Becke Line

- A bright halo observed near the border of a particle immersed in a liquid of a different refractive index



When analyzing glass

- Refractive index (RI) is compared
- Density is compared

- Broken glass shows two kinds of fractures: primary (first-made fractures) and secondary (subsequent fractures). Primary fractures are radial. They look like the spokes of a wheel as they radiate away from the point of pressure, such as the point in which a rock is thrown or a projectile is shot through a window. Radial fractures start on the opposite side of the force. Secondary fractures are concentric and are the result of continuing pressure. They form a series of broken circles or arcs around the point of impact and between the radial lines. Concentric fractures start on the same side of the glass as the original force.

Glass Fragments

- G**• Glass is a hard, brittle, amorphous substance that is composed of silicon oxides mixed with various metal oxides.
- L**• Amorphous solids have their atoms arranged randomly, unlike crystals.
- A**• Tempered glass is stronger than normal glass due to rapid heating and cooling.
- S**• Laminated glass found in car windshields has a layer of plastic between two pieces of ordinary window glass.

Glass Fragments

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A
S
S

- For the forensic scientist, the problem of glass comparison is one that depends on the need to find and measure those properties that will associate one glass fragment with another while minimizing or eliminating other sources.
- To compare glass fragments, a forensic scientist evaluates two important physical properties: density and refractive index.

Flotation Method

- The flotation method is a rather precise and rapid method for comparing glass densities.
- In the flotation method, a glass particle is immersed in a liquid.
- The density of the liquid is carefully adjusted by the addition of small amounts of an appropriate liquid until the glass chip remains suspended in the liquid medium.
- At this point, the glass will have the same density as the liquid medium and can be compared to other relevant pieces of glass which will remain suspended, sink, or float.

Immersion Method

- The flotation and the immersion methods are best used to determine a glass fragment's density and refractive index, respectively.
- The latter involves immersing a glass particle in a liquid medium whose refractive index is varied until it is equal to that of the glass particle.
- At this point, known as the match point, the Becke line disappears and minimum contrast between liquid and particle is observed.
- The Becke line is a bright halo near the boarder of a particle that is immersed in a liquid of a different refractive index.

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Analyzing Cracks

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- The penetration of window glass by a projectile, whether it is a bullet or a stone, produces cracks which radiate outward (radial fractures) and encircle the hole (concentric fractures).
- By analyzing the radial and concentric fracture patterns in glass, the forensic scientist can determine the direction of impact.

Analyzing Cracks

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- A high-velocity projectile such as a bullet often leaves a hole that is wider at the exit side, and hence its examination is important in determining the direction of impact.
- The direction of impact can also be accomplished by applying the 3R Rule: *Radial* cracks form a *Right* angle on the *Reverse* side of the force.
- The sequence of impacts when there have been successive penetrations of glass, is frequently possible to determine because a fracture always terminates at an existing line of fracture.

Collection of Glass

- If even the remotest possibility exists that glass fragments may be pieced together, every effort must be made to collect all the glass found.
- When an individual fit is thought improbable, the evidence collector must submit all glass evidence found in the possession of the suspect along with a representative sample of broken glass remaining at the crime scene.

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Collection of Glass

- The glass fragments should be packaged in solid containers to avoid further breakage.
- If the suspect's shoes and/or clothing are to be examined for the presence of glass fragments, they should be individually wrapped in paper and transmitted to the laboratory.

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