CASE REPORT

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Collision Marks on Plastic Materials on Motor Vehicles

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ABSTRACT: In vehicular collisions involving plastic materials, the structure of the stretching plastic film is deposited on the motor vehicle. This structure, characterized by ridges and depressions with embedding fibers, could be used for identification of vehicles.

KEYWORDS: criminalistics, motor vehicle accidents, plastics, trace evidence

A valuable method of identifying hit-and-run vehicles is to study the marks they received during impact with other vehicles. These marks may either be imprints of headlamp housing, wheel rims, bumpers, imprinted tire serial number, and registration plates, or of rub-off materials such as paint, rubber from tires, pedestrian's clothing, skin, hair, blood, tree bark, road dust, mud, bits of glass, and parts of ornamental trim [*1*]. Recently, we have established two important characteristics—threading of the paint films of the vehicle and embedding of the fibers of the clothing of the victim—in paint-fabric contact in vehicular collisions. Here, we report a new trace evidence in traffic collisions involving plastic material: the structure of the stretching plastic film embedded on the motor vehicle.

The Case

A bicyclist was hit and killed by a tourist van of known description coming in the opposite direction. The van did not stop after the collision and it was later secured. A careful examination of the van showed some rub-off marks spread in an area of about 50 by 50 mm (2 by 2 in.) on its front body, 405 mm (16 in.) off right, and at a height of 1170 mm (46 in.) above ground level. The paint scrapings carrying the marks were collected for a detailed examination, as the origin of the marks was not readily known. The bicycle showed some induced damage on its front fork and the plastic sleeve of the right-side brake lever handle was found damaged. Minute flakes of paint were noticed on this plastic sleeve.

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The Marks and Their Identification

The rub-off marks on the surface of the van as revealed under a microscope in oblique illumination are shown in Fig. 1. These marks are characterized by ridges and depressions with embedding fibers at many places. The marks, on a detailed study, are found to be made by the structure of the molten plastic films. The appearance of this structure on the vehicle surface may be explained by the following reason: the heat generated during collision had softened the plastic material and further stretched it into films as shown in Fig. 2; as the force was sufficiently great to permit melting of the plastic, the emerging film structure in molten state was transferred on the van surface; during this process shedding of the plastic filaments from the film structure took place. Thus, while the temperature of the colliding plastic is moderate, softening of the plastic takes place and the emerging films are deposited on the vehicle surface; in such situations, the films can be peeled off from the surface. When the heat produced in violent collisions is sufficiently great resulting in plastic melt, the emerging plastic film structure leaves its characteristic marks on the vehicle surface. While it is possible to see the presence of plastic films in less violent and grazing collisions, the char-

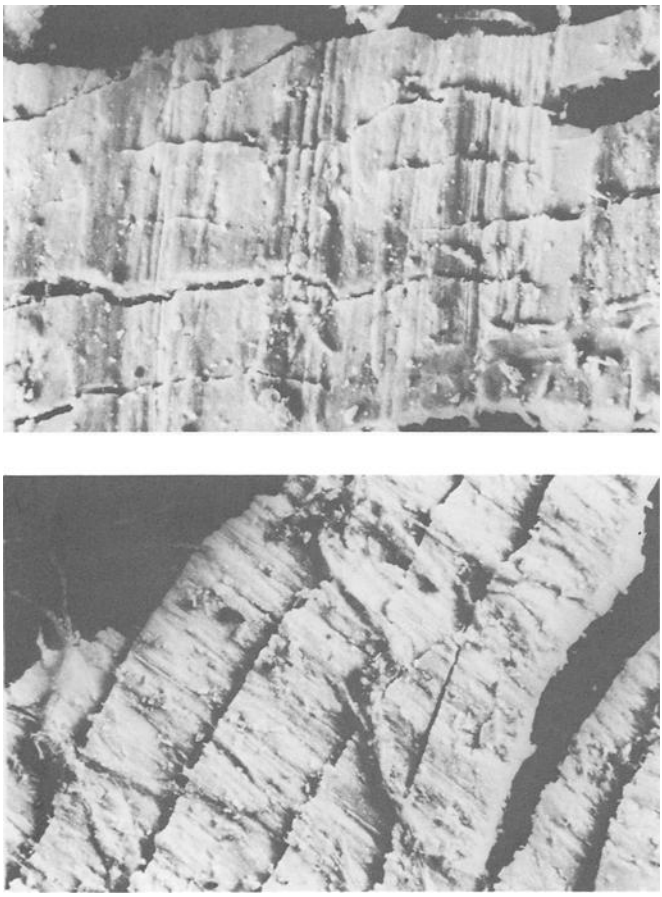

FIG. 1—*Photomicrographs (×26) of the marks noticed on the surface of a van which was involved in a collision.* (top) *ridges and depressions and* (bottom) *embedding fibers and filaments on the ridges and depressions. The cracks are caused by scraping of the paint from the vehicle surface.*

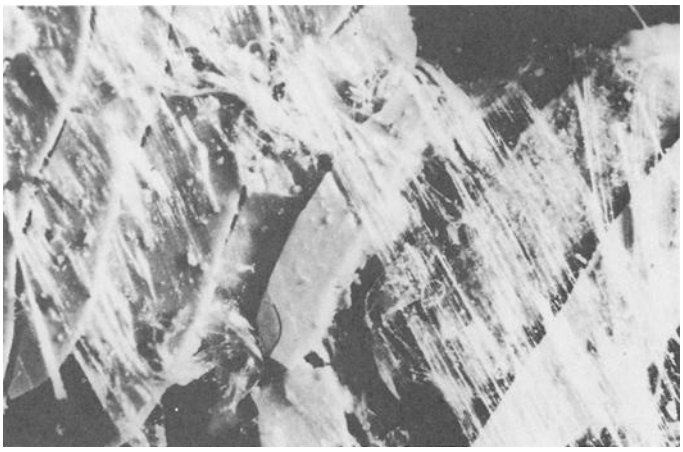

FIG. 2—*Photomicrograph (×26) of the plastic film spread on the paint surface. In less violent and grazing collisions where softening of the plastic takes place, thin plastic films as seen in this figure are deposited on the vehicle surface. In more violent collisions resulting in plastic melt, the above structure in molten condition is embedded on the vehicle surface giving the characteristic appearance of the marks seen in Fig. 1.*

acteristic marks caused by such a film structure are significant proof that they resulted from a violent collision.

The damaged surface of the plastic sleeve of the bicycle brake lever handle on microscopic examination (×21, ×62) in transmitted light showed the following two features: the melting of the plastic and the marks of stretching (Fig. 3). These features are to be expected in any plastic material involved in collisions of the type discussed in this article. The minute flakes of paint noticed on the plastic sleeve showed a two-layered structure which matched well with the layer structure of the control paint of the van.

The method of proof in this type of investigation differs from a toolmark comparison where the striations in the marks are related to defects in the tool. Here, the characteristic

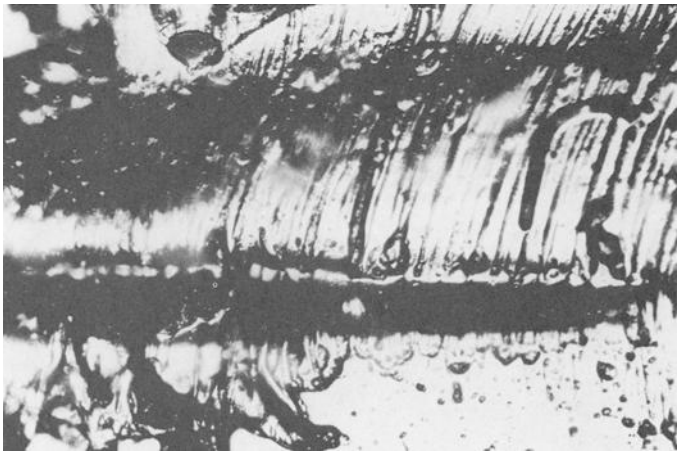

FIG. 3—*Photomicrograph (×26, in transmitted light) of the surface of the damaged plastic sleeve showing melting and marks of stretching.*

structure resulting from molten plastic films is best connected to its source by discovering in the latter the two features, plastic melt and marks of stretching.

Summary

We have identified a useful contact trace, namely, the structure of the stretching plastic film on the vehicle during violent collisions. The presence of this structure on the vehicle surface together with finding of the features, plastic melt and marks of stretching, on the colliding plastic material would constitute physical evidence of contact. The structure, although characteristic in its occurrence, permits its use only as class evidence, because of the possibility of its duplication. Positive identification of the embedding plastic filaments on the film structure and detection of traces of the paint of the vehicle on the colliding plastic would render additional proof. More important, the appearance of such structure on the vehicle is conclusive proof that the vehicle had struck some plastic material forcibly, and had therefore been in a collision. With the increasing use of plastics as covering and ornamental materials in automobiles, this type of evidence invites attention in future investigations.

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Reference

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