

FINGERPRINT BLACK POWDER AVAILABLE IN THAILAND

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Abstract: Seven brands of black and magnetic powders available in Thailand were used to investigate the number of minutiae of developed latent fingerprint on 12 surface samples by Automated Fingerprint Identification System (AFIS). Each brand was repeated 10 times on each surface. The average numbers of minutiae of each brand was compared to those on inked print (52), and then calculate as percentage. The efficiency of powders on each surface was graded according to the percentage: >80% = excellent, 66-80% = good, 50-65% = fair, and <50% = poor. Magnetic powder and 3 brands of black powder (Silver Arrow, BVDA and Siam Smart) were scored excellent on every surface, whereas the efficiency of the others varied on different surfaces. CD cassette plastic box was the only surface that scored excellent for every brand, others scored differently for each brand.

Introduction: Fingerprint is one of the important evidence in forensic science. The ridge characteristic detail or minutiae of fingerprint can be used to identify individual. There are three types of fingerprints: visible, plastic and latent fingerprints. Visible and plastic fingerprints can be seen by naked eye; but latent fingerprint must be developed to make them visible and can be found on porous, nonporous and semi-porous surfaces. Since powdering is the easiest method to be used both in crime scene and laboratory especially black powder. The aim of this study was to find the best black powder available in Thailand to develop the latent fingerprint on various non-porous surfaces. In this study seven brands of black powders including magnetic powder were used to develop fresh latent fingerprint on 12 non-porous surface samples.

Methodology: The reference fingerprint was made by pressing the left index finger on KS police mate ink pad then pressed on white A4 paper. Twelve surface samples (glossy paper, CD cassette plastic box, transparent sheet, white surface DVD, shiny surface DVD, glass plate, color metal box, shiny metal box, white paint coated metal, yellow paint coated metal, metal cabinet, and ceramic tile) were cleaned by wet and dry clothes to eliminate fingerprint residues. The left index finger was touched on the forehead to get the sweat and grease, then pressed on each clean surface for 5 seconds. The fresh latent fingerprint on each surface was developed using black powder or Sirchie magnetic powder and applicator. Seven brands of black powder: Silver Arrow (China), Sirchie and Spex (USA), Tetra (UK), BVDA (Netherland), PS and Siam Smart (or KS) (Japan) and Spex squirrel brushes were used. After powdering, the prints were photographed with scale by a Nikon D90 digital camera then lifted with transparent tape (3M 600), and pressed on a postcard paper. Each surface sample was repeated 10 times for each powder brand (total

960 fingerprint samples) to obtain the average number. The number of minutiae on both reference and surface samples were counted by AFIS at the Central Scientific Crime Detection Division, the Royal Thai Police. Each average number was calculated into percentage and the grade was then given.

$$\text{Percentage (\%)} = \frac{\text{Average number of minutiae of developing fingerprint} \times 100}{\text{Number of minutiae of reference}}$$

The percentage of each fingerprint powder was categorized according to its quality

> 80%	=	Excellent
66 - 80%	=	Good
50 - 65%	=	Fair
< 50%	=	Poor

Results, Discussion and Conclusion: The number of minutiae of the reference fingerprint counted by AFIS was 52. The average numbers of minutiae of developed fingerprint and their grades for all 12 surface samples using 8 powder brands were shown in Table 1. The result showed that only grades E (excellent) and G (good) were obtained from all powder brands. Grade E on every surface sample was obtained from magnetic powder, Silver Arrow, BVDA, Siam Smart, and Spex [G (80%) on glass plate]. Both grades E and G were obtained from Sirchie, PS, and Tetra (Figures 1 and 2).

Magnetic powder is one of the best in the present study. Because of its magnetizing effect on metal surface, this can be solved by shaking or blowing off the stuck powder. In addition, on vertical surface, the powder tend to fall off easily and hard to shake or blow to eliminate the excess. “Silver Arrow” has the dark color and very good adhesive property, make it hard to clean. “BVDA” has higher weight and lighter color than other regular black powders. It can be used like magnetic powder, but the quality is lower. “Siam Smart” and “Spex” are similar it has dark color and very good adhesive property due to its very small particle size. In addition, Siam Smart can be used to brush latent fingerprint many times per one attached powder. “Sirchie” has dark color, but the adhesive property is not that great. “PS” and “Siam Smart” are very small particle size, but adhesive property of PS is worse in this study. “Tetra” has the worst adhesive properties.

CD cassette plastic box was the best surface in this study, since all fingerprint powders gave an excellent grade. Glossy paper, White surface DVD, shiny surface DVD, shiny metal box, white paint coated metal, yellow paint coated metal, and metal cabinet were come second. Most of the fingerprints powders gave excellent grade except PS brand. It is concluded that fingerprint powder can be used on these surfaces. Transparent sheet, glass plate, color metal box, and ceramic were not suitable for fingerprint powdering because more than one brand of powders were not able to give an excellent grade on these surfaces. This is due to a very slippery surface so the latent fingerprint residue can be easily removed while brushing. If the deposits are left for a longer period of time, the results may be better.

In conclusion, the efficiency of each brand of black powder is different. On many surfaces, the brands of black powder did not affect the quality of the developed fingerprint, but on some

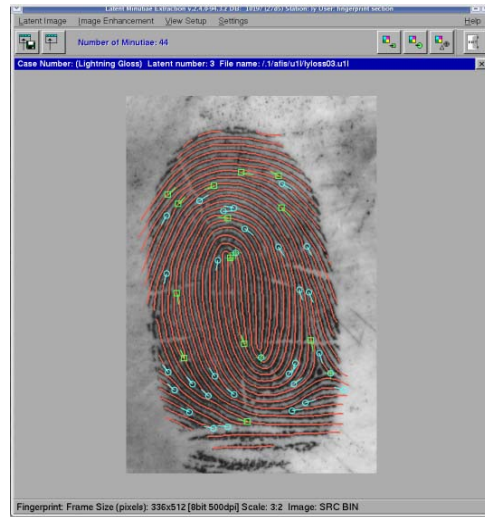
surfaces specific type of powder is required for better result. But in the real situation no fingerprint can be retrieved right away, therefore, further research should be done by varying fingerprint residue deposition time before developing to find the best powder brand.

Table 1. The average number of minutiae and their grades obtained from 12 surface samples and 8 fingerprint powder brands

Powder Brand Surface	Magne- tic	Silver Arrow	BVDA	Sirchie	Siam Smart	Spex	PS	Tetra
Glossy paper	44.50 E	44.70 E	43.80 E	44.10 E	43.30 E	43.40 E	43.40 E	40.80 G
CD Cassette plastic box	46.30 E	45.40 E	44.90 E	44.40 E	43.50 E	43.60 E	42.00 E	41.70 E
Transparent sheet	44.20 E	43.30 E	42.70 E	40.50 G	42.90 E	43.90 E	41.10 G	40.30 E
White surface DVD	45.60 E	44.90 E	41.90 E	41.70 E	44.90 E	43.10 E	40.20 G	39.90 E
Shiny surface DVD	44.80 E	43.90 E	42.00 E	42.50 E	43.70 E	43.70 E	40.00 G	41.90 G
Glass plate	42.40 E	44.20 E	41.80 E	38.00 G	42.60 E	41.60 G	41.60 G	39.30 E
Color metal box	45.40 E	43.00 E	44.70 E	40.60 G	42.00 E	44.60 E	42.30 E	38.30 E
Shiny metal box	43.20 E	42.70 E	43.60 E	41.70 E	44.70 E	44.40 E	41.40 G	40.90 G
White paint coated metal	43.90 E	44.30 E	43.70 E	42.70 E	43.80 E	44.30 E	43.30 E	37.90 G
Yellow paint coated metal	42.50 E	43.60 E	43.10 E	43.60 E	43.60 E	42.40 E	42.40 E	38.40 G
Metal cabinet	43.10 E	42.80 E	44.20 E	43.30 E	44.80 E	42.90 E	43.00 E	40.30 G
Ceramic tile	43.90 E	43.20 E	42.80 E	41.20 G	43.90 E	43.40 E	40.80 G	40.40 E



(a)

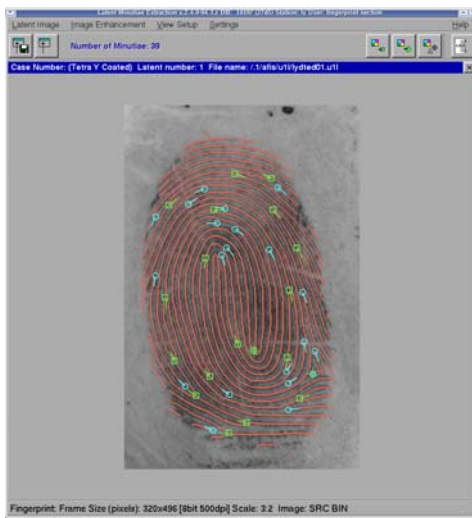


(b)

Figure 1. The image of developed latent fingerprint using Silver Arrow black powder on glossy paper, the number of minutiae = 44, grade E (a) after powdering (b) from AFIS



(a)



(b)

Figure 2. The image of developed latent fingerprint using Tetra black powder on yellow paint coated metal, the number of minutiae = 38, grade G (a) after powdering (b) from AFIS

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