# Supplementary data : details of filament images analysis

## 1. Stability of polymerized permanent filaments

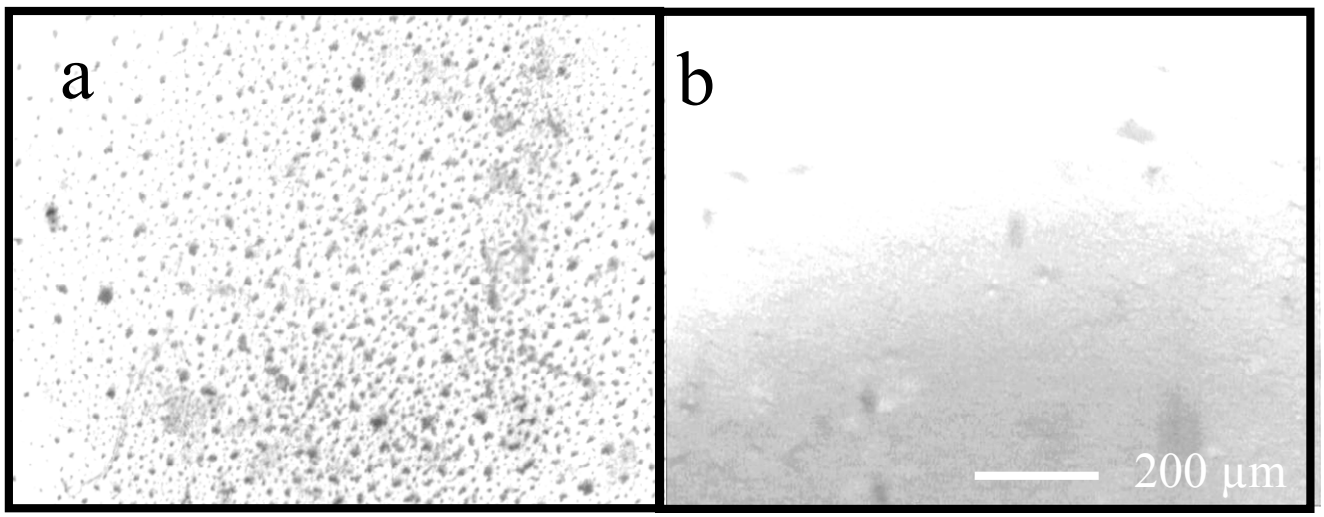
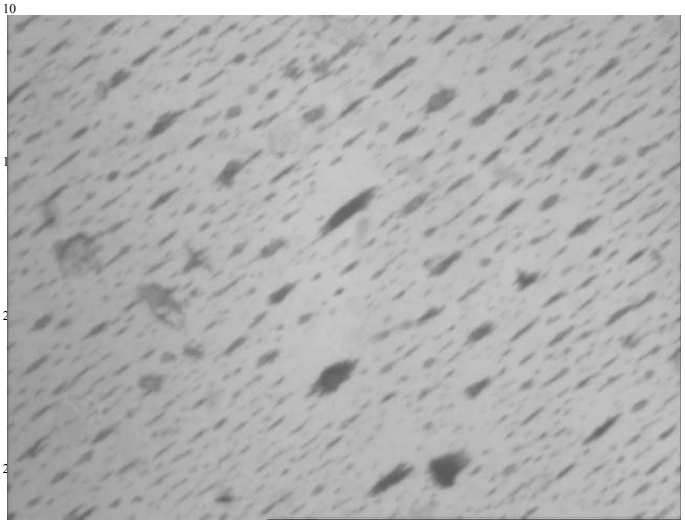



**Fig. 1. Formation of permanent filaments on glass substrate.** a) View of permanent filaments grafted onto a support. Each dot on the picture is a vertical filament viewed from above. Filaments stand ultrasonic bath and detergent washing, even when magnetic field is turned off. b) in absence of Jeffamine, filaments are not polymerized and are disrupted when magnetic field is turned off.

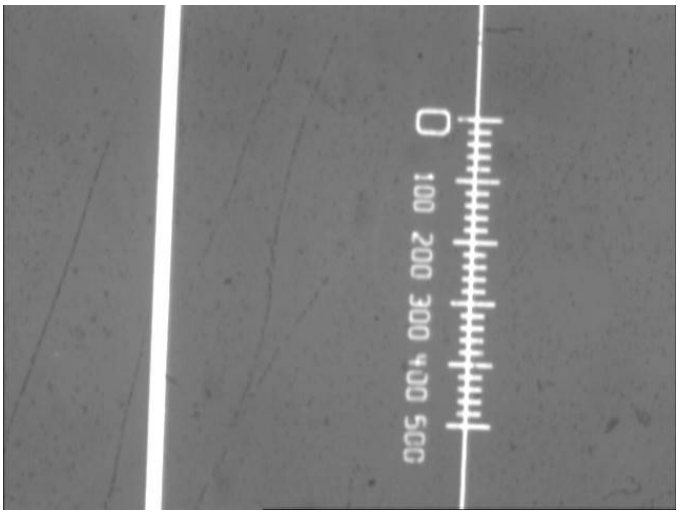
# Procedure for semi-automatic analysis of filament images

1) **Manual elimination** of non-significant defects preventing correct image analysis : bubbles, pollutants.

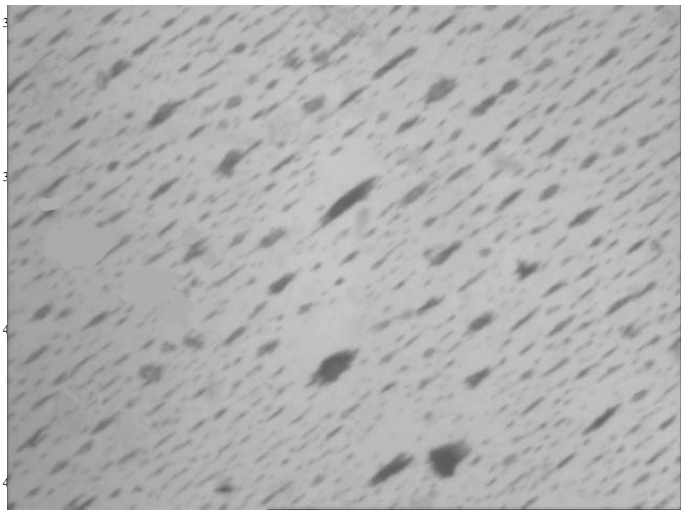
2) **Semi-automatic algorithm for image analysis**. Involves a manual threshold for distinguishing filaments from image background. Includes spatial calibration using a geometric reference. X and Y axis are equivalent for spatial calibration. Filaments retained and processed by the algorithm are indicated by a white perimeter. Other filaments are not taken into account in the quantitative analysis. The discarded filaments correspond to the smallest items.



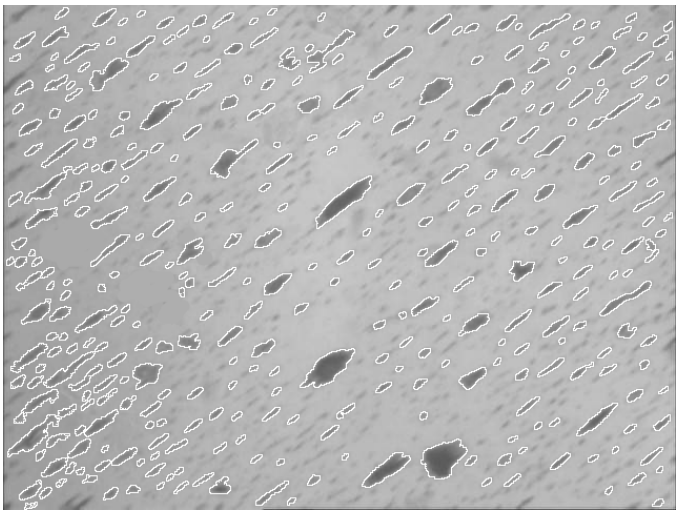
a) Raw image




d) Size standard (microns)



b) Image after manual removal of non significant defects



c) Segmented image showing filaments taken into account

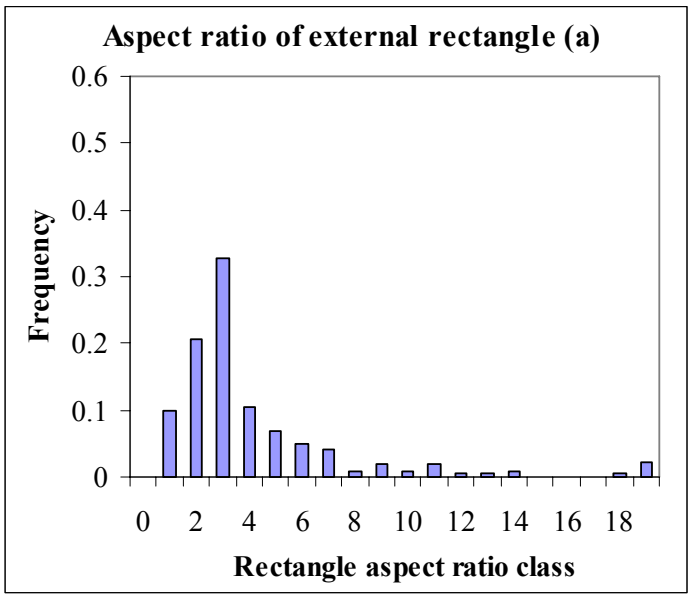
3) **Extraction of shape characteristics.**

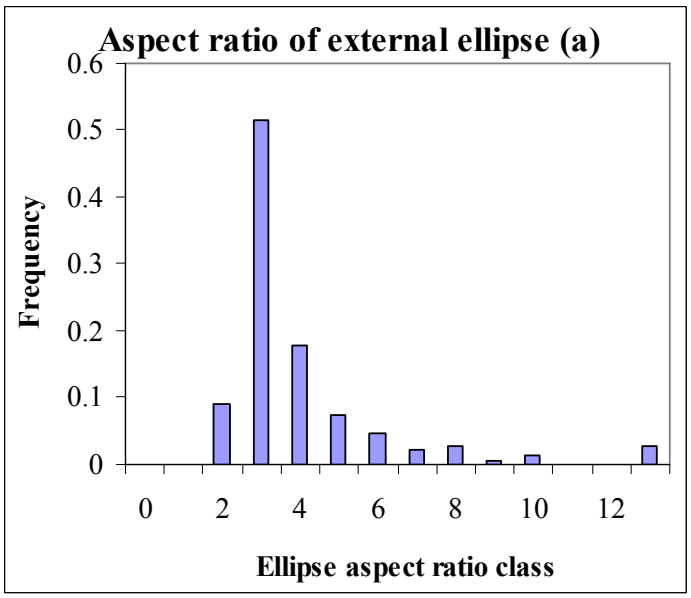
| Object # | Equivalent Ellipse Major Axis | Equivalent Ellipse Minor Axis | Equivalent Rect Long Side | Equivalent Rect Short Side | Equivalent Rect Diagonal | Area | Orientation | Ratio of Equivalent Ellipse Axes | Ratio of Equivalent Rect Sides | Elongation Factor | Compactness Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20.30544 | 7.39911 | 17.10633 | 6.89803 | 18.02776 | 118 | 53.17421 | 2.74431 | 2.47989 | 3.5873 | 0.4958 |
| 2 | 11.62862 | 3.83222 | 10.15177 | 3.44768 | 10.44031 | 35 | 48.11362 | 3.03444 | 2.94453 | 4.02778 | 0.4321 |
| 3 | 7.2671 | 4.90576 | 4.86938 | 4.86938 | 5.65685 | 28 | 45.56987 | 1.48134 | 1 | 3.03571 | 0.57143 |
| 4 | 7.11369 | 4.6536 | 4.72091 | 4.72091 | 5.65685 | 26 | 8.95415 | 1.52864 | 1 | 2.42857 | 0.65 |
| 5 | 5.12564 | 5.12564 | 3.89016 | 3.89016 | 4.24264 | 22 | 38.79128 | 1 | 1 | 2.26087 | 0.61111 |
| 6 | 7.41422 | 3.60632 | 4.57882 | 4.57882 | 5.65685 | 21 | 31.47974 | 2.0559 | 1 | 2.90476 | 0.7 |
| 7 | 6.92856 | 3.12403 | 5.12426 | 3.31755 | 5.83095 | 17 | 29.35348 | 2.21783 | 1.54459 | 3.41176 | 0.48571 |
| 8 | 7.51294 | 3.7284 | 4.65792 | 4.65792 | 5.65685 | 22 | 55.38802 | 2.01506 | 1 | 2.82609 | 0.52381 |
| 9 | 15.40491 | 5.95091 | 12.65211 | 5.69075 | 13 | 72 | 51.85697 | 2.58866 | 2.22328 | 3.19178 | 0.5035 |
| 10 | 11.29346 | 5.1861 | 8.17933 | 5.62393 | 9.43398 | 46 | 35.14326 | 2.17764 | 1.45438 | 2.40385 | 0.52273 |
| 11 | 20.01276 | 7.95267 | 16.2063 | 7.71305 | 17.46425 | 125 | 57.54591 | 2.51648 | 2.10115 | 2.99231 | 0.52521 |
| 12 | 10.20616 | 2.8693 | 9.30347 | 2.4722 | 9.21954 | 23 | 63.91788 | 3.55703 | 3.76324 | 2.66667 | 0.41071 |
| 13 | 15.05557 | 4.39761 | 13.5969 | 3.8244 | 13.34166 | 52 | 152.99705 | 3.42358 | 3.5553 | 2.06061 | 0.57778 |
| 14 | 50.09174 | 2.87225 | 53.62198 | 2.10734 | 53.03772 | 113 | 59.5404 | 17.43989 | 25.44528 | 2.21088 | 0.23395 |
| 15 | 13.68447 | 5.39647 | 11.12559 | 5.21321 | 12.08305 | 58 | 42.7619 | 2.53582 | 2.13412 | 3.48276 | 0.43939 |
| 16 | 11.8565 | 6.0137 | 7.38318 | 7.38318 | 9.89949 | 56 | 36.82094 | 1.97158 | 1 | 2.92857 | 0.62222 |
| 17 | 14.06588 | 6.06482 | 10.82332 | 6.19034 | 11.6619 | 67 | 36.85977 | 2.31926 | 1.74842 | 2.92958 | 0.50758 |
| 18 | 12.29756 | 3.83083 | 10.91749 | 3.38906 | 10.44031 | 37 | 31.26674 | 3.21016 | 3.2214 | 4.5 | 0.38542 |
| 19 | 11.81613 | 3.98691 | 10.23706 | 3.61432 | 10.44031 | 37 | 65.36035 | 2.96373 | 2.83236 | 3.47619 | 0.56061 |
| 20 | 10.57455 | 4.69583 | 7.9388 | 4.91258 | 8.06226 | 39 | 43.93789 | 2.2519 | 1.61601 | 3.17073 | 0.54167 |
| 21 | 8.18299 | 3.7343 | 5.97185 | 4.01886 | 6.40312 | 24 | 41.27772 | 2.1913 | 1.48596 | 2.74074 | 0.57143 |
| 22 | 10.66199 | 4.41849 | 8.43009 | 4.38904 | 8.94427 | 37 | 47.87146 | 2.41304 | 1.92072 | 3.02222 | 0.52857 |
| 23 | 14.82597 | 4.29395 | 13.41791 | 3.72636 | 13.34166 | 50 | 3.64036 | 3.45276 | 3.60081 | 2.08571 | 0.50505 |
| 24 | 20.2152 | 3.08623 | 20.29979 | 2.41382 | 20.09975 | 49 | 108.43992 | 6.55013 | 8.40982 | 2.58537 | 0.35 |
| 25 | 15.52663 | 2.70612 | 15.35684 | 2.14888 | 15.13275 | 33 | 40.35317 | 5.7376 | 7.14644 | 5.54545 | 0.25 |

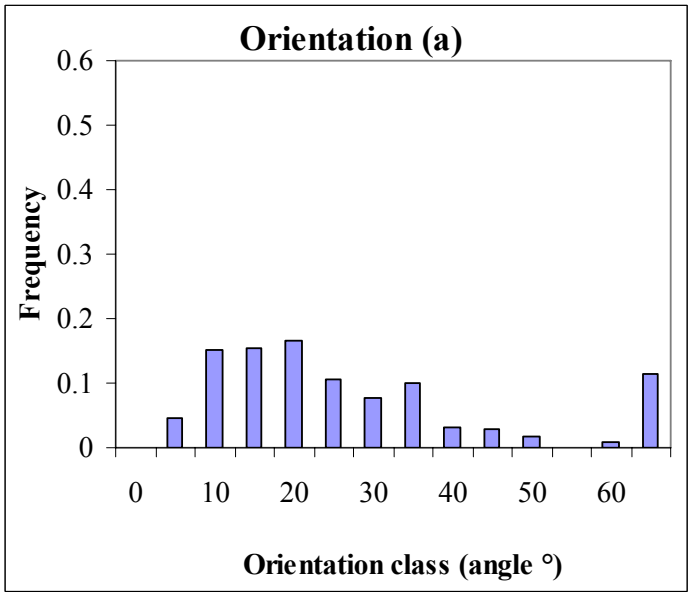
Example of table containing shape characteristics for each single segmented filament

**Quantitative image analysis of filaments prepared with particle concentration a=1.6. $10^{-4}$ M**

Number of segmented filaments = 219



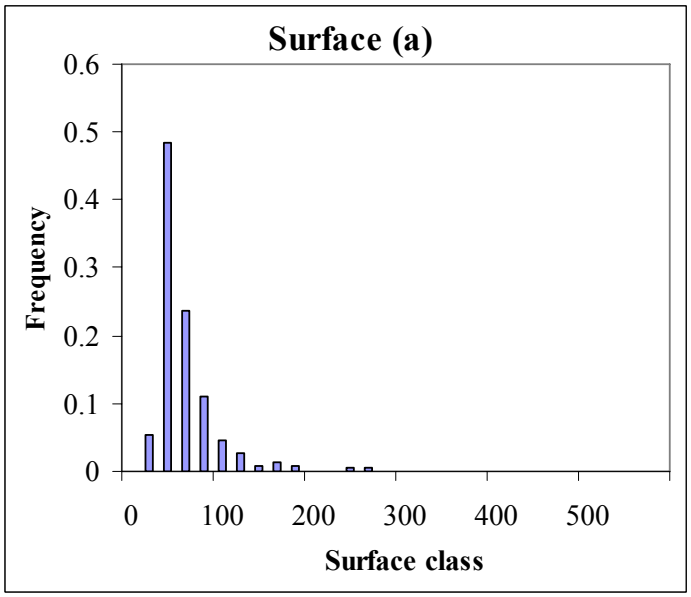
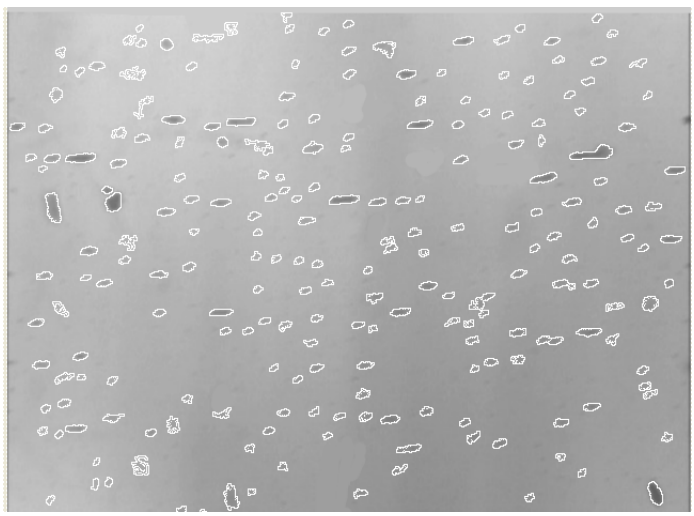
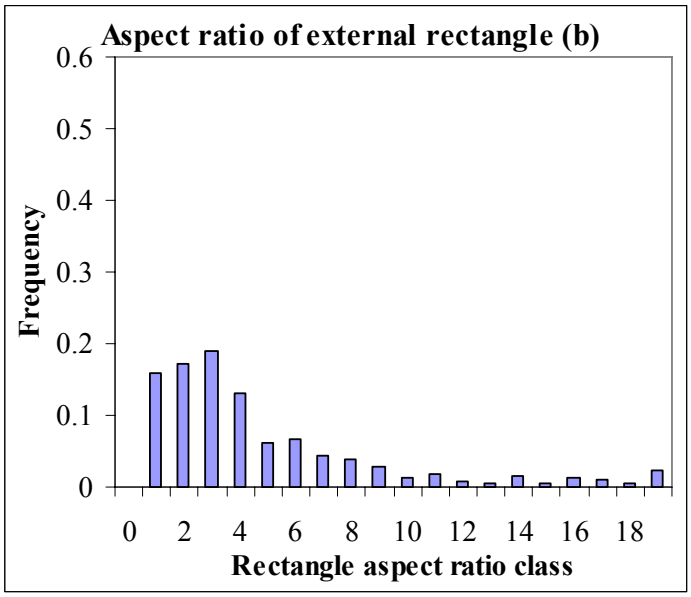
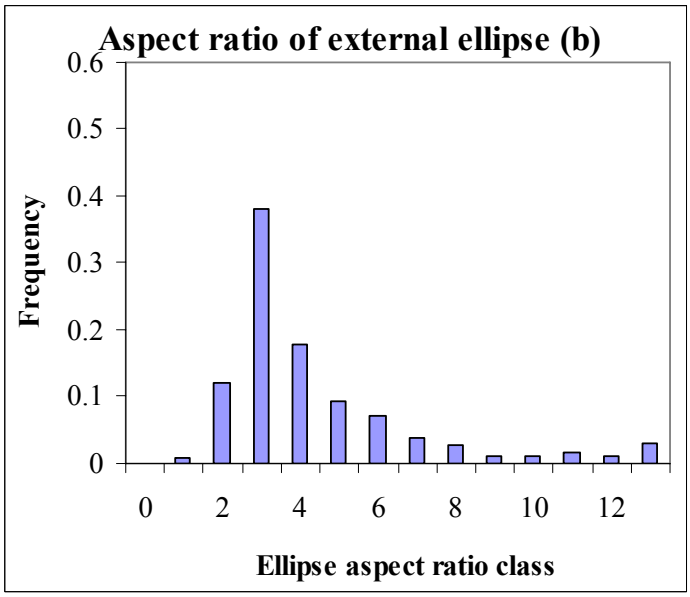



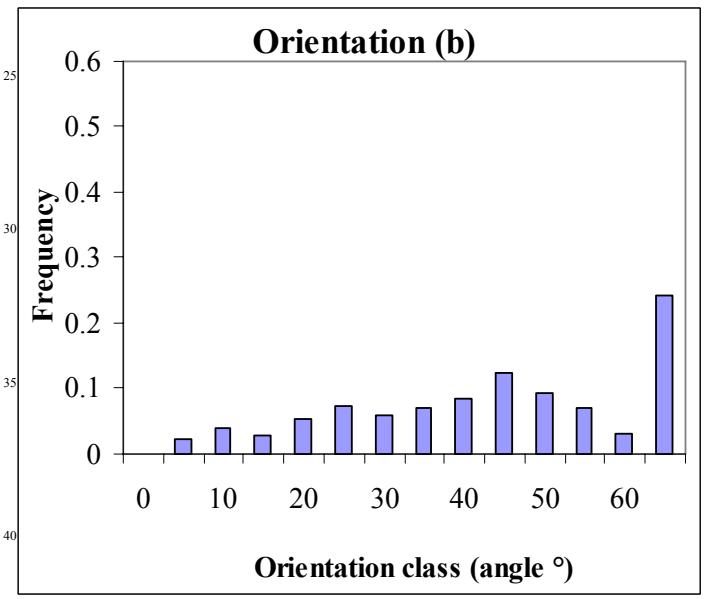

Image of filaments formed at particle concentration a = 1.6 E -4 M



**Quantitative image analysis of filaments prepared with particle concentration b=4.15. $10^{-4}$ M**
Number of segmented filaments = 330



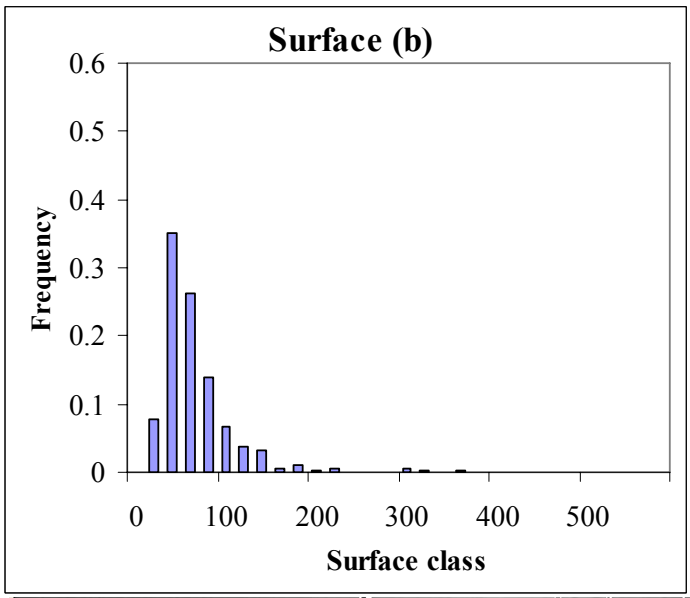
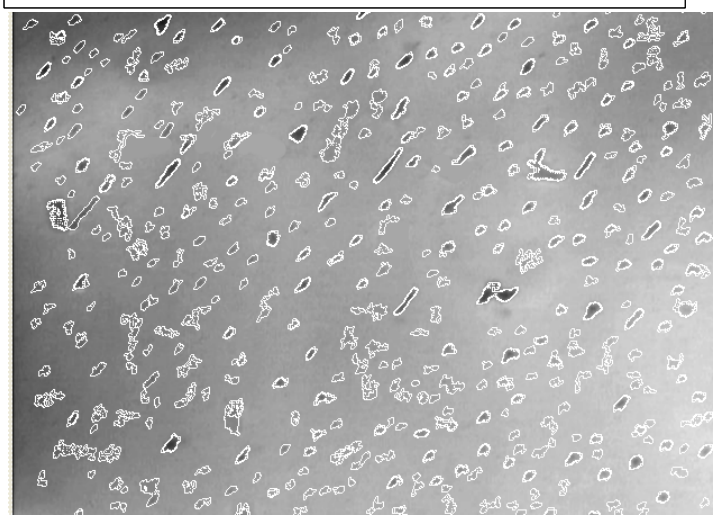
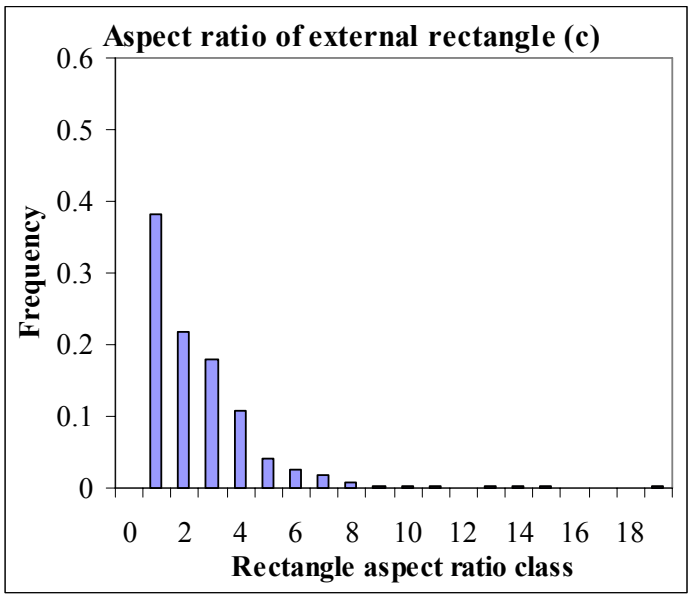



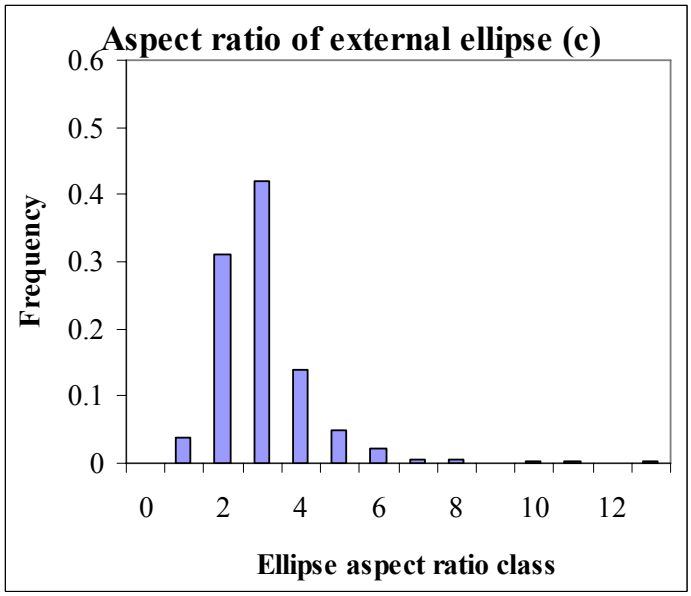

Image of filaments formed at particle concentration b = 4.15 E-4 M

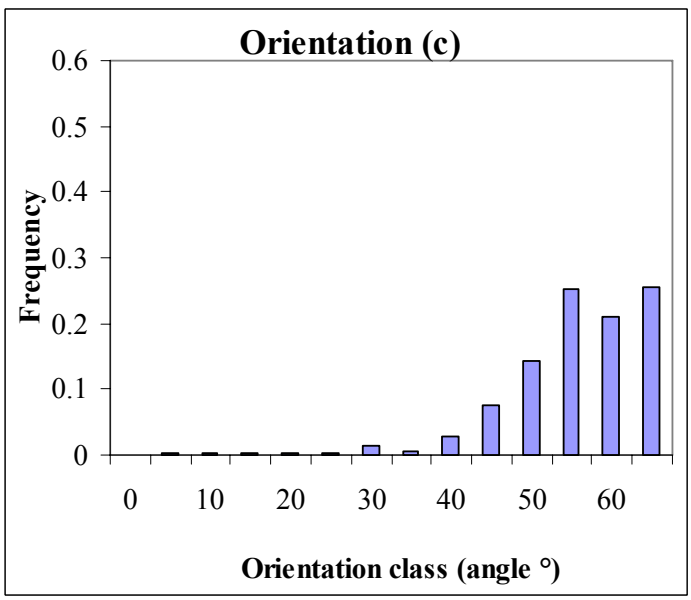


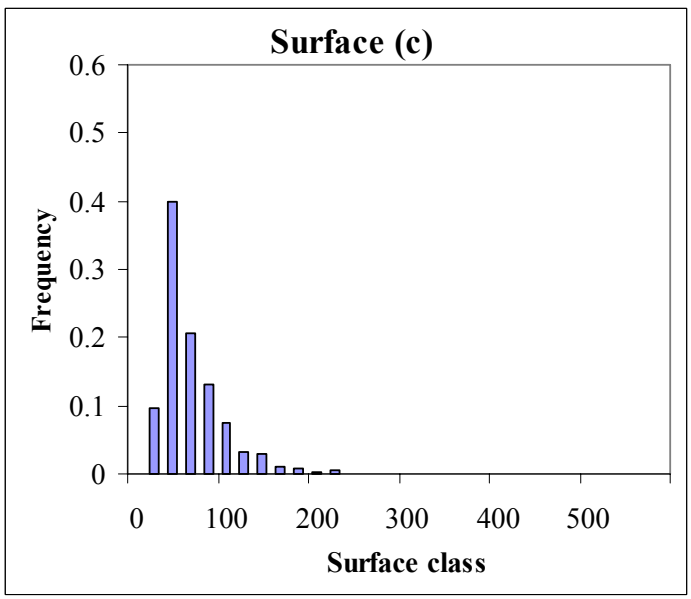
**Quantitative image analysis of filaments prepared with particle concentration c=1.6. $10^{-3}$ M**

Number of segmented filaments = 521

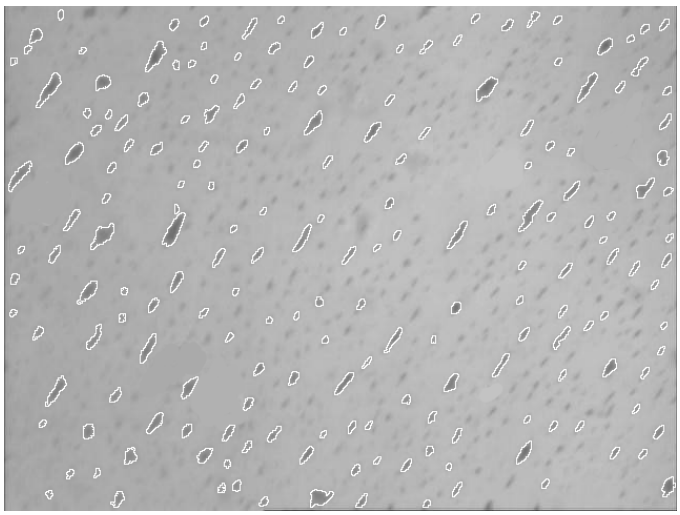


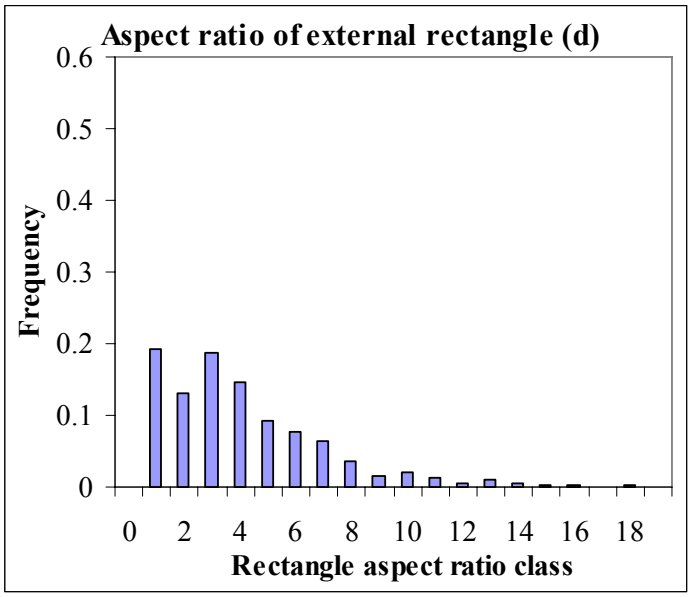



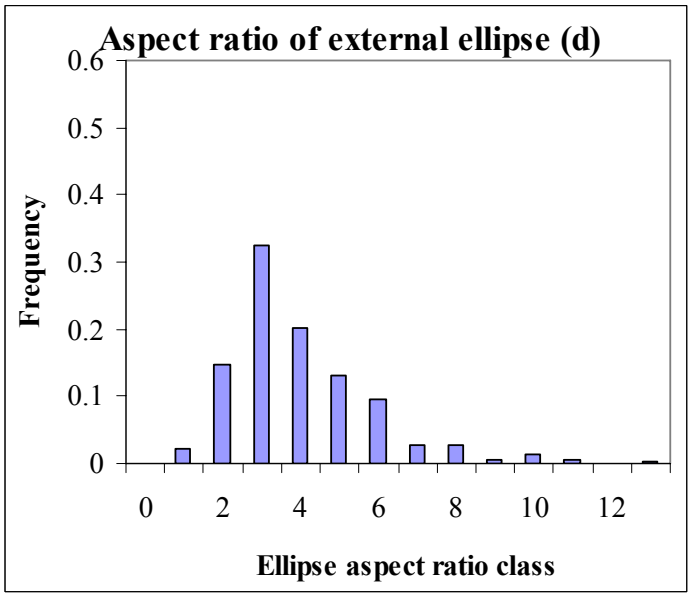



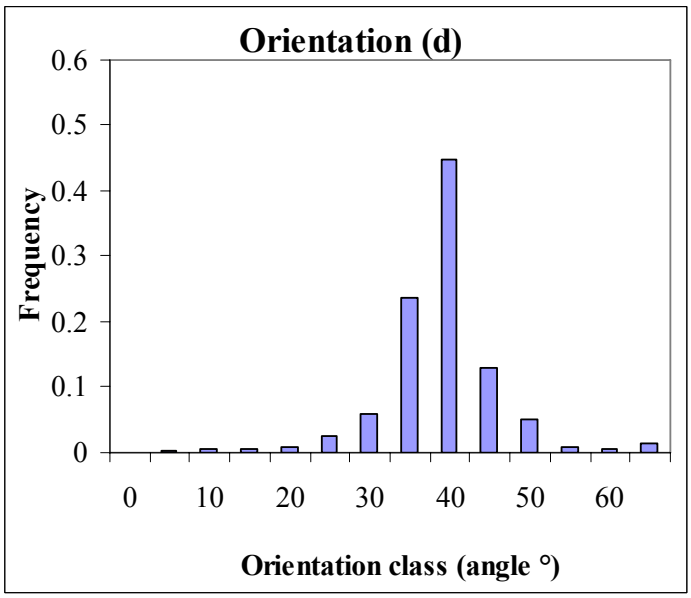

Segmented image of filaments formed at particle concentration c = 1.6 E-3 M. the filaments taken into account by the segmentation algorithm are surrounded by a white perimeter.

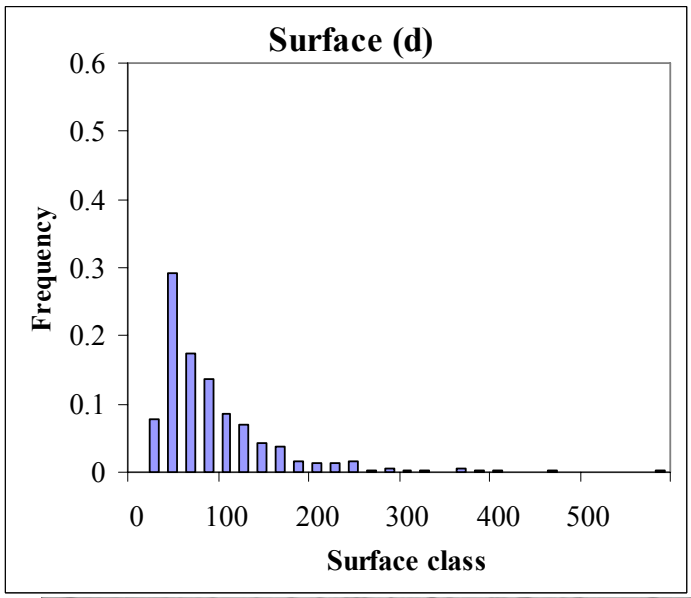


**Quantitative image analysis of filaments prepared with particle concentration d=4.15. $10^{-3}$ M/**
Number of segmented filaments = 462

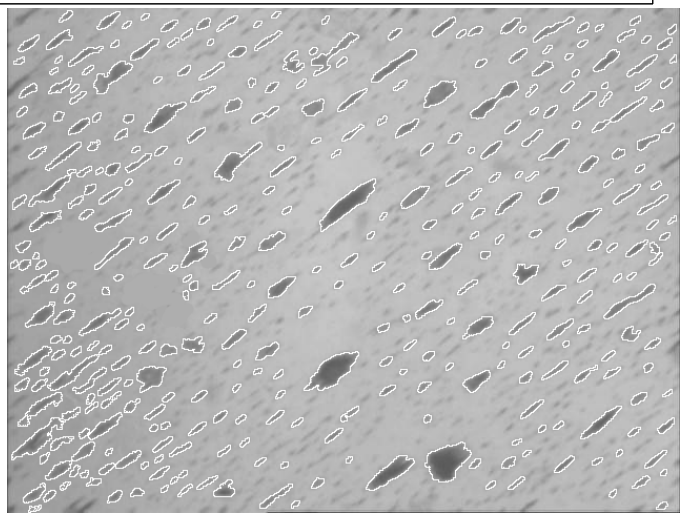


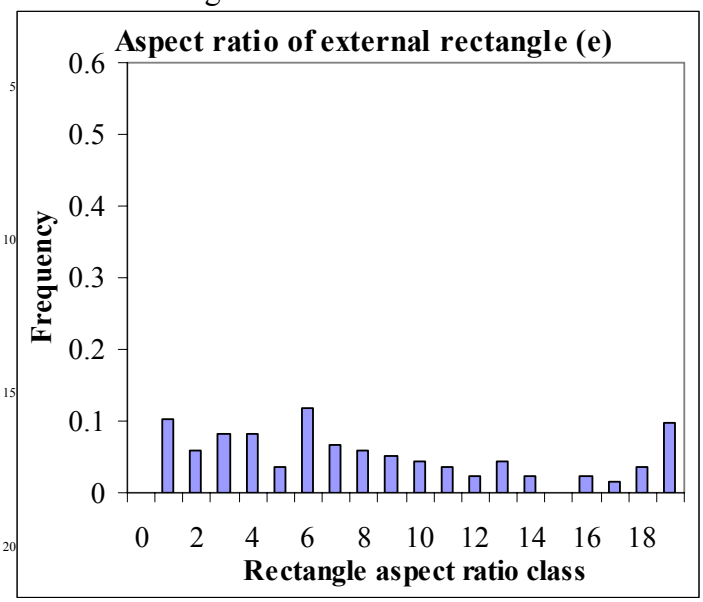



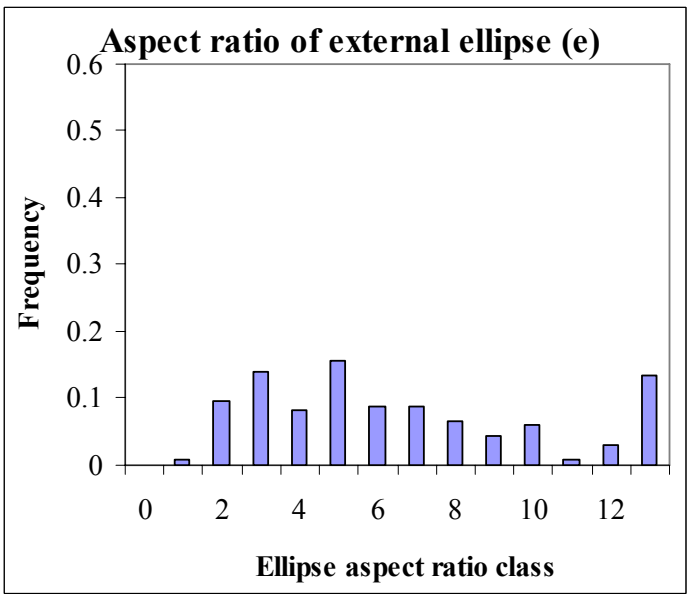

Segmented image of filaments formed with particle concentration d = 4.15 E-3M . The filaments taken into account by the segmentation algorithm are surrounded by a white perimeter.

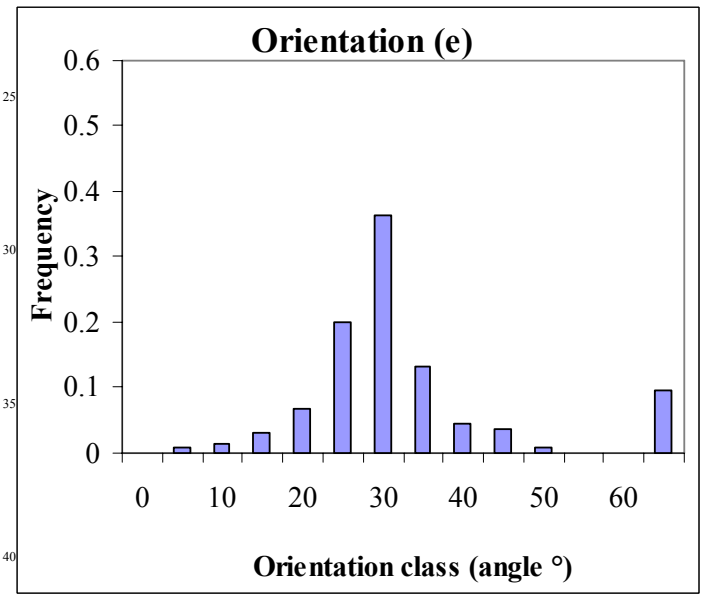


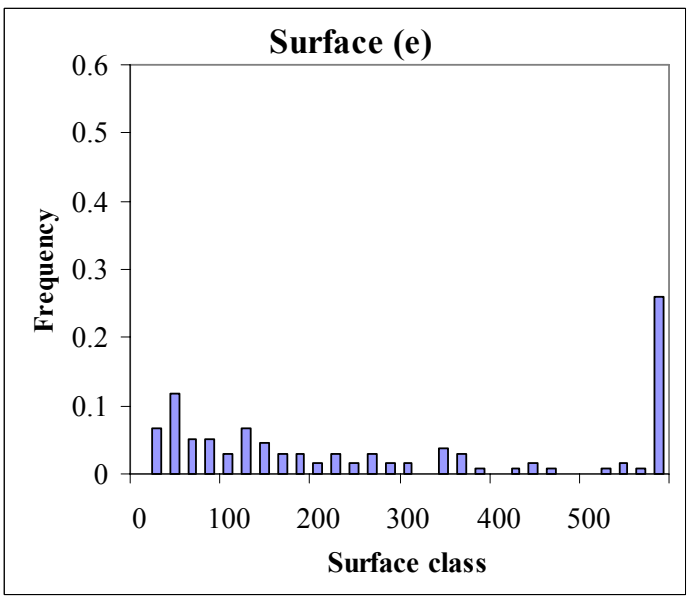
**Quantitative image analysis of filaments prepared with particle concentration e=8.3. $10^{-3}$ M**

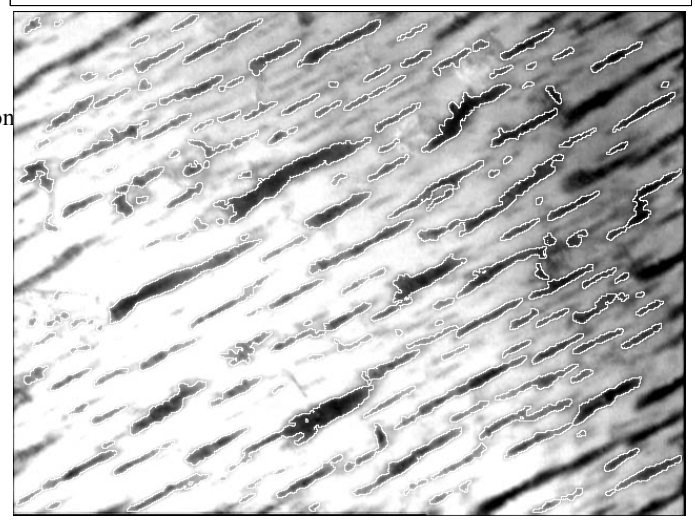
Number of segmented filaments = 135



Segmented image of filaments formed with particle concentration e = 8.3 E-3 M. The filaments taken into account by the segmentation algorithm are surrounded by a white perimeter.