

# Επιστήμη Ινών και Ινοδομών

Ελευθέριος Γ. Ανδριώτης PhD



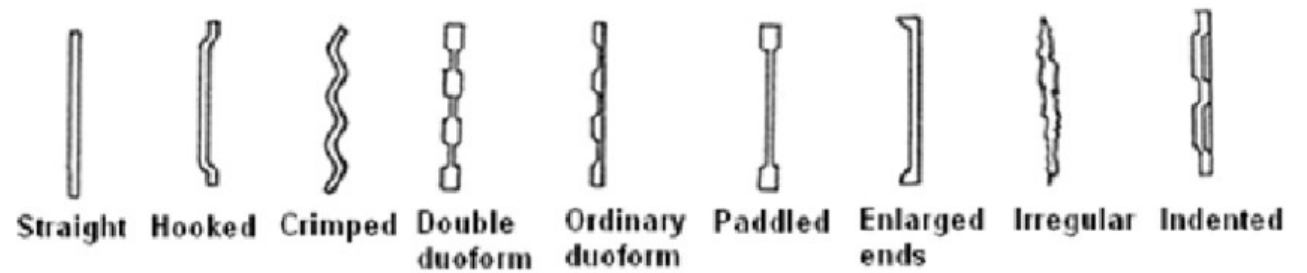
# ΠΕΡΙΕΧΟΜΕΝΟ ΜΑΘΗΜΑΤΟΣ

- Εισαγωγικές έννοιες της επιστήμης και τεχνολογίας πολυμερών με έμφαση στην κατασκευή, κατάταξη και ταυτοποίηση κλωστοϋφαντουργικών ινών
- Εισαγωγή στις έννοιες του μοριακού βάρους, της κρυσταλλικότητας και των θερμοφυσικών ιδιοτήτων των πολυμερών
- Ταυτοποίηση κλωστοϋφαντουργικών ινών με την εφαρμογή τεχνικών οπτικής μικροσκοπίας

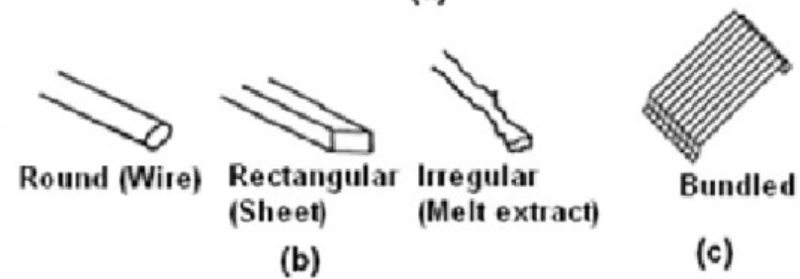


# Μορφολογία Ινών

- Εξέταση του σχήματος και της μορφής μιας ίνας
- Εφαρμογή σε συνεχείς και ασυνεχείς ίνες



(a)



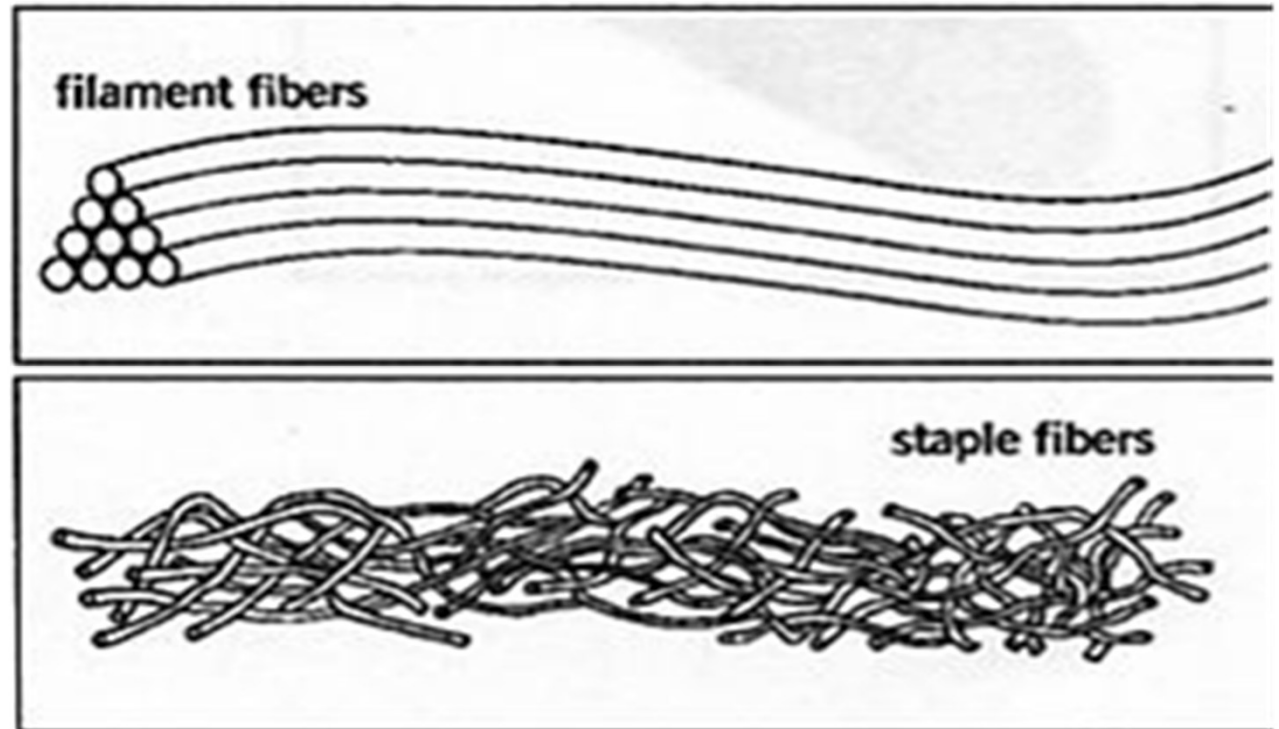
(b)

(c)



## Οπτική Παρατήρηση

- Ταχεία αναγνώριση ινών
- Κατάταξη με βάση τις κατηγορίες που έχουν αναφερθεί



# Χρώμα

- Λευκό χρώμα κατά την μακροσκοπική παρατήρηση
- Πλήρης ή μερική διαφάνεια (τεχνητές ίνες)



# Χρώμα

- Πράσινη, μπλε ή ροζ απόχρωση
- Τεχνητές ίνες με χρωστική για να διαχωρίζονται από τις φυσικές λευκές ή υπόλευκες



# Χρώμα

- Λευκό ή υπόλευκο χρώμα (φυσικές ίνες γενικά)
- Μερικά ζώα έχουν σκούρο ή μαύρο μαλλί-τρίχωμα
- Βαμβάκι (υπόλευκο)
- Λινάρι, κάνναβη κ.α. (καφέ)





## Διαστάσεις-Μήκος

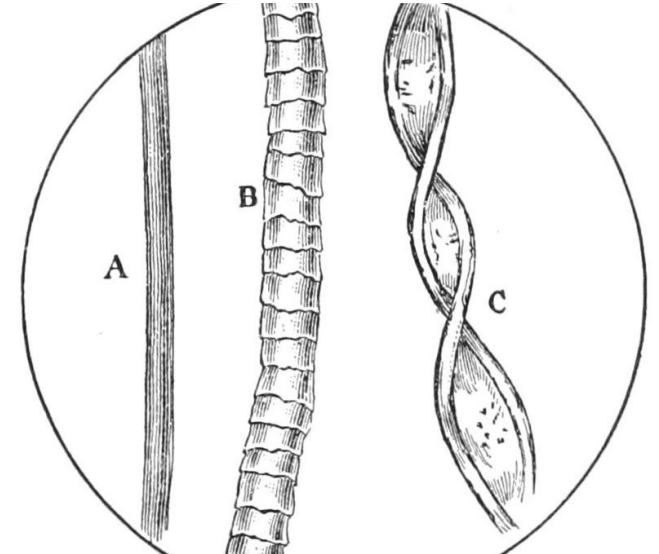
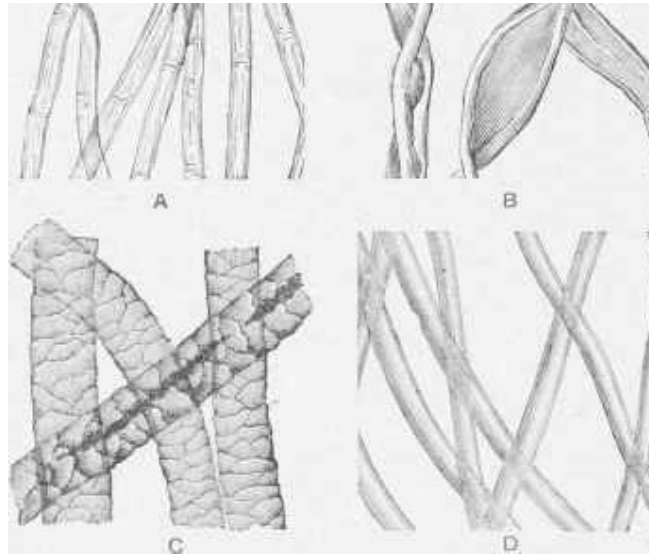
- Χαρακτηριστικές περιοχές τιμών μήκους
- Μικρού μήκους ίνες (short staple): βαμβάκι, λινάρι κ.α.
- Μεγάλου μήκους ίνες (long staple): μαλλί κ.α.





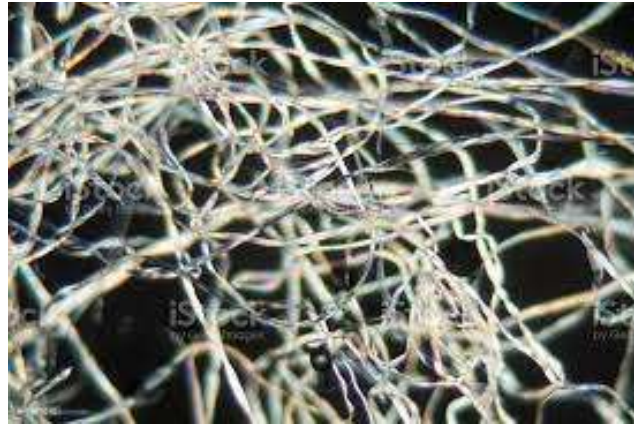
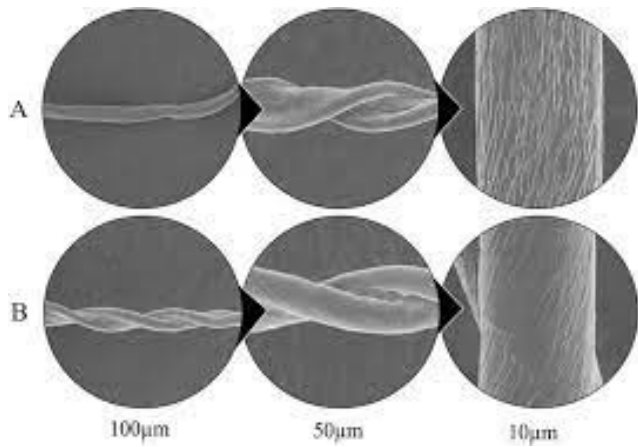
## Διαστάσεις-Διατομή

- Λεπτότητα ή Πάχος (Fineness)
- Βαμβάκι: οι μακριές ίνες είναι λεπτότερες
- Μαλλί: οι μακριές ίνες είναι πιο χοντρές
- Μονάδα μέτρησης dtex (decitex): mass in gram per 10,000 m



# Οπτική Μικροσκοπία

Μικρή Μεγέθυνση: Χρήση μεγεθυντικού φακού

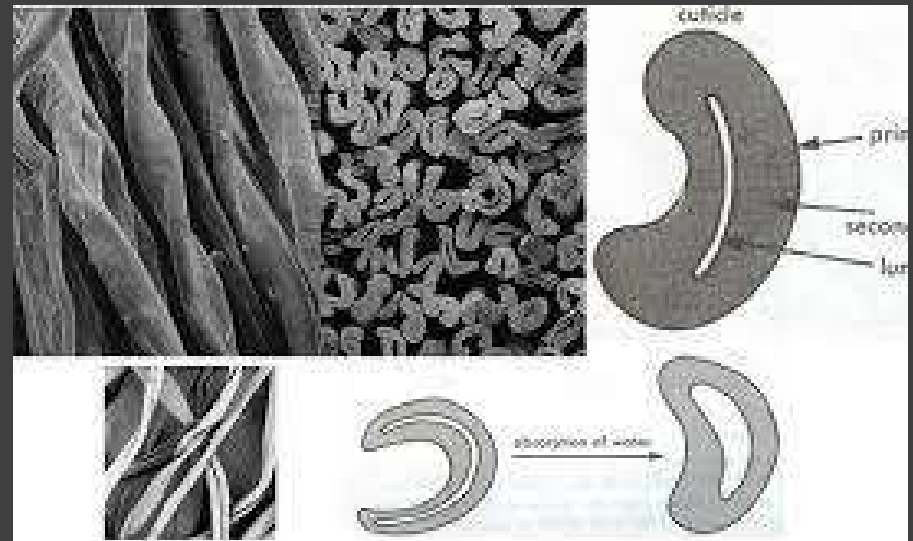
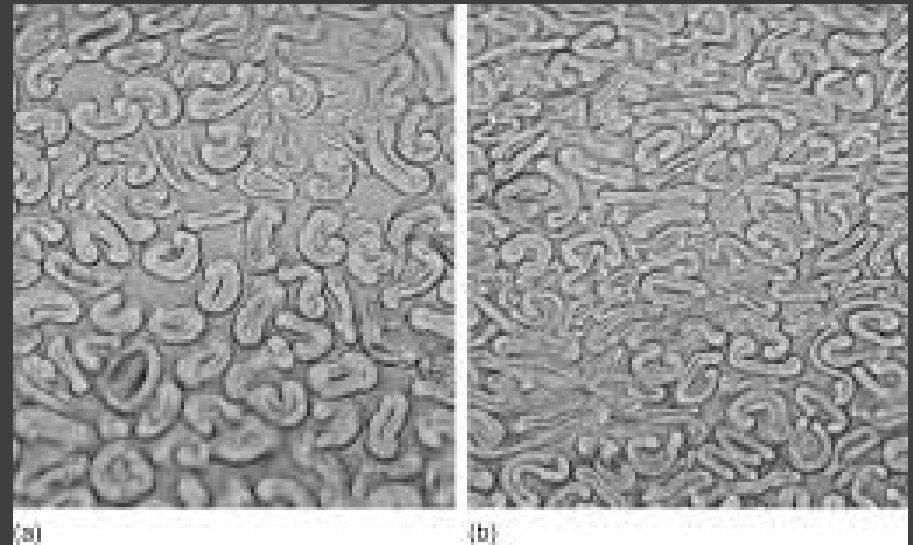


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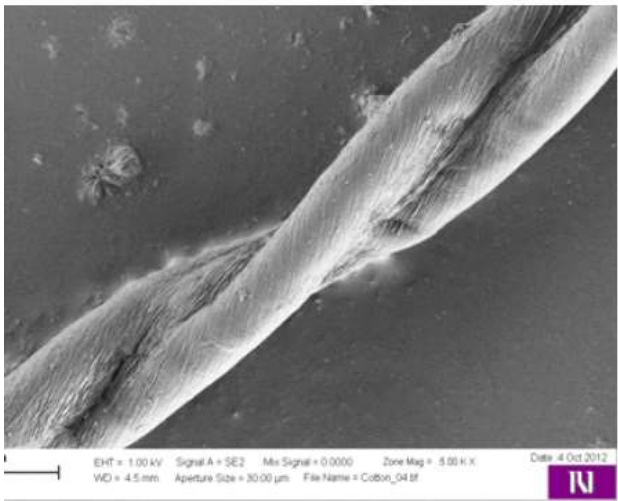
Βαμβάκι

# Οπτική Μικροσκοπία

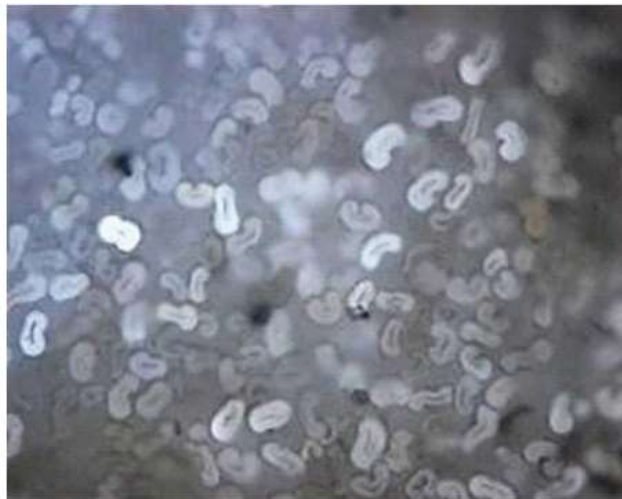
- Βαμβάκι



# Οπτική Μικροσκοπία



(a)



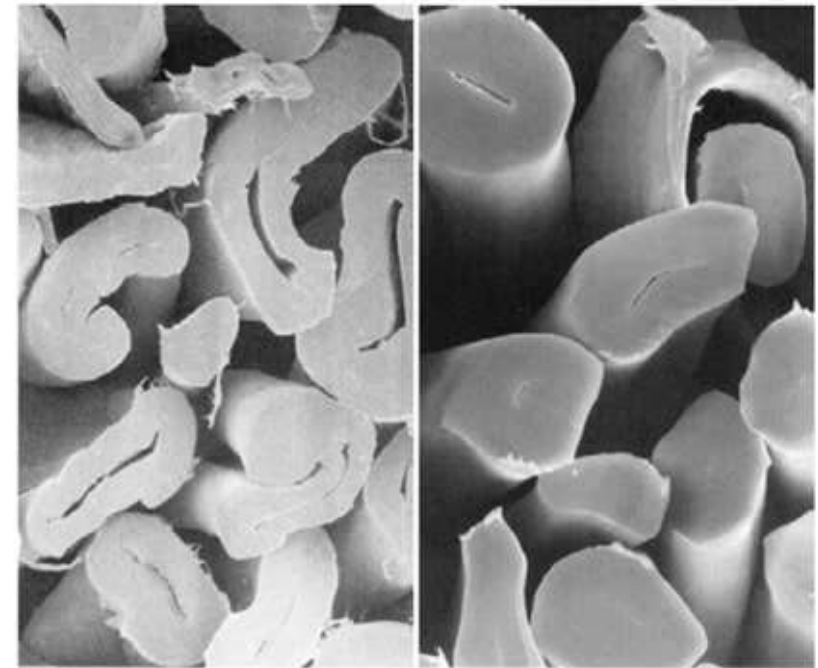
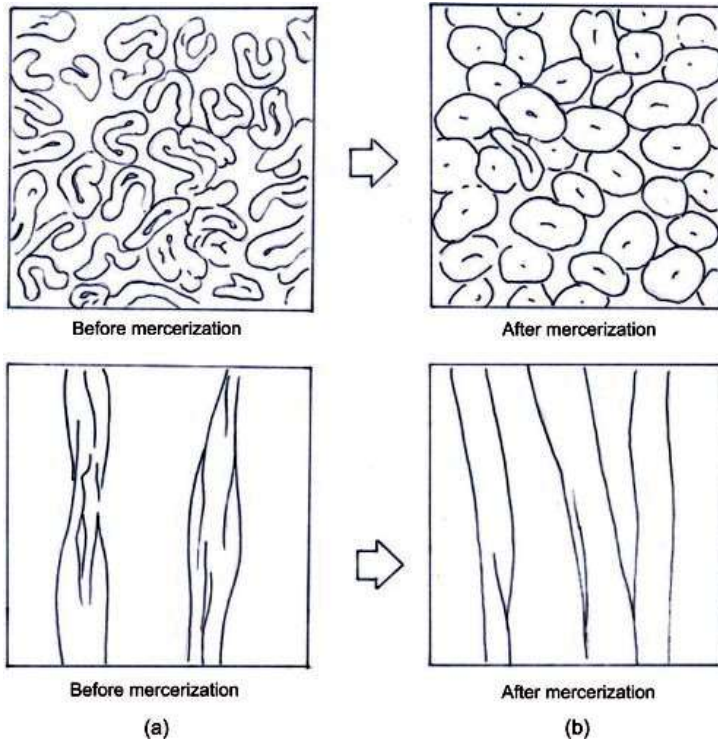
(b)

2. a) Longitudinal view (5000x magnification) and b) cross-section of cotton fibre

- Βαμβάκι

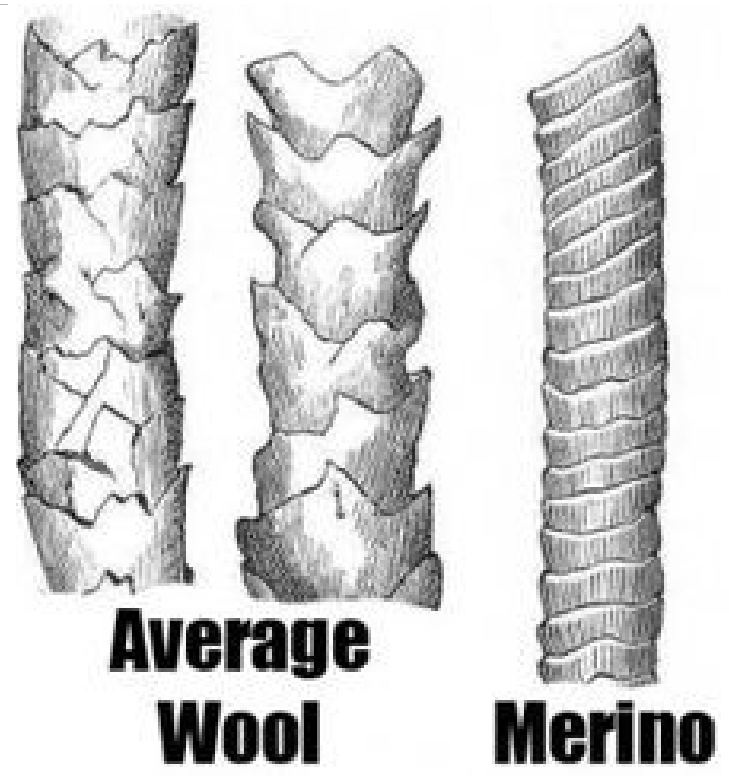
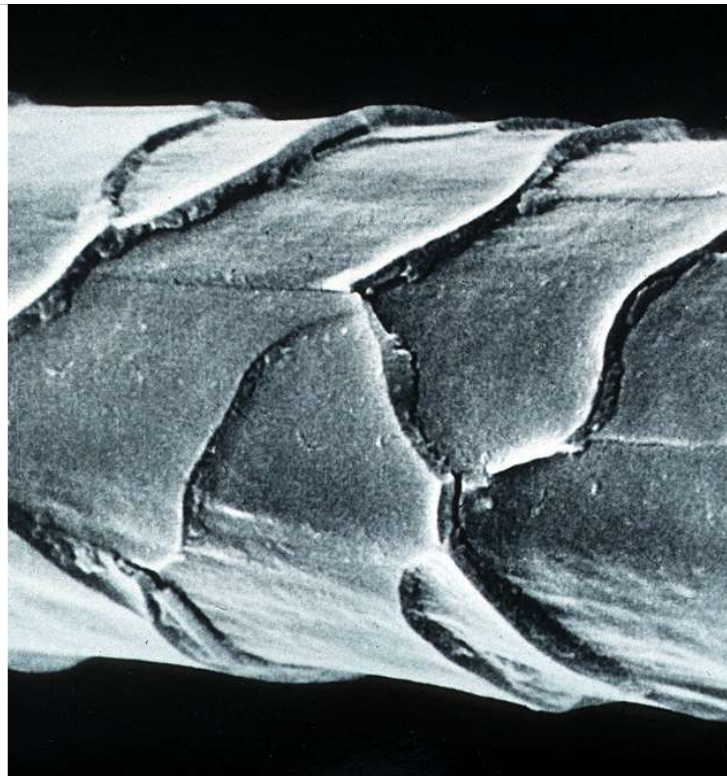
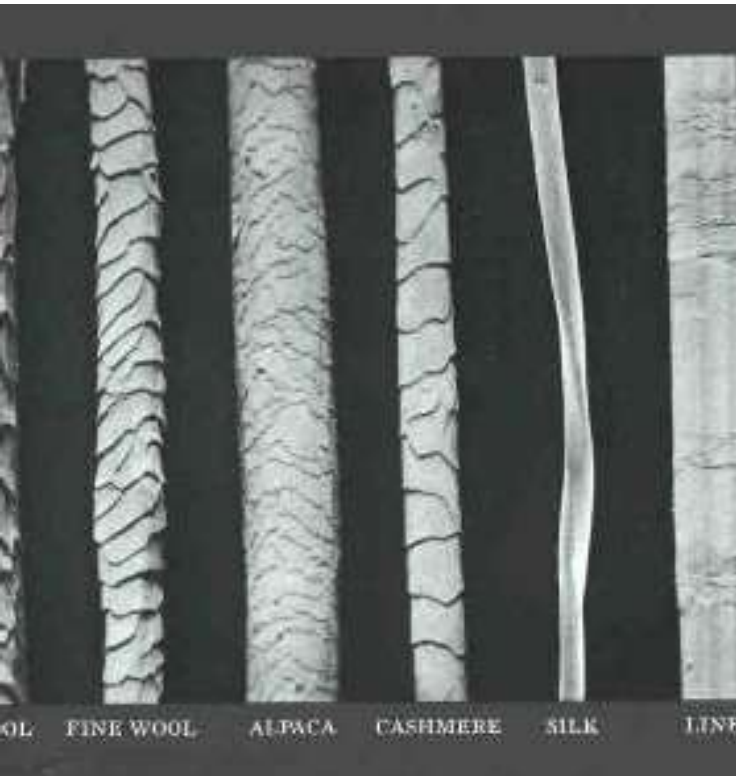
# Οπτική Μικροσκοπία

Βαμβάκι



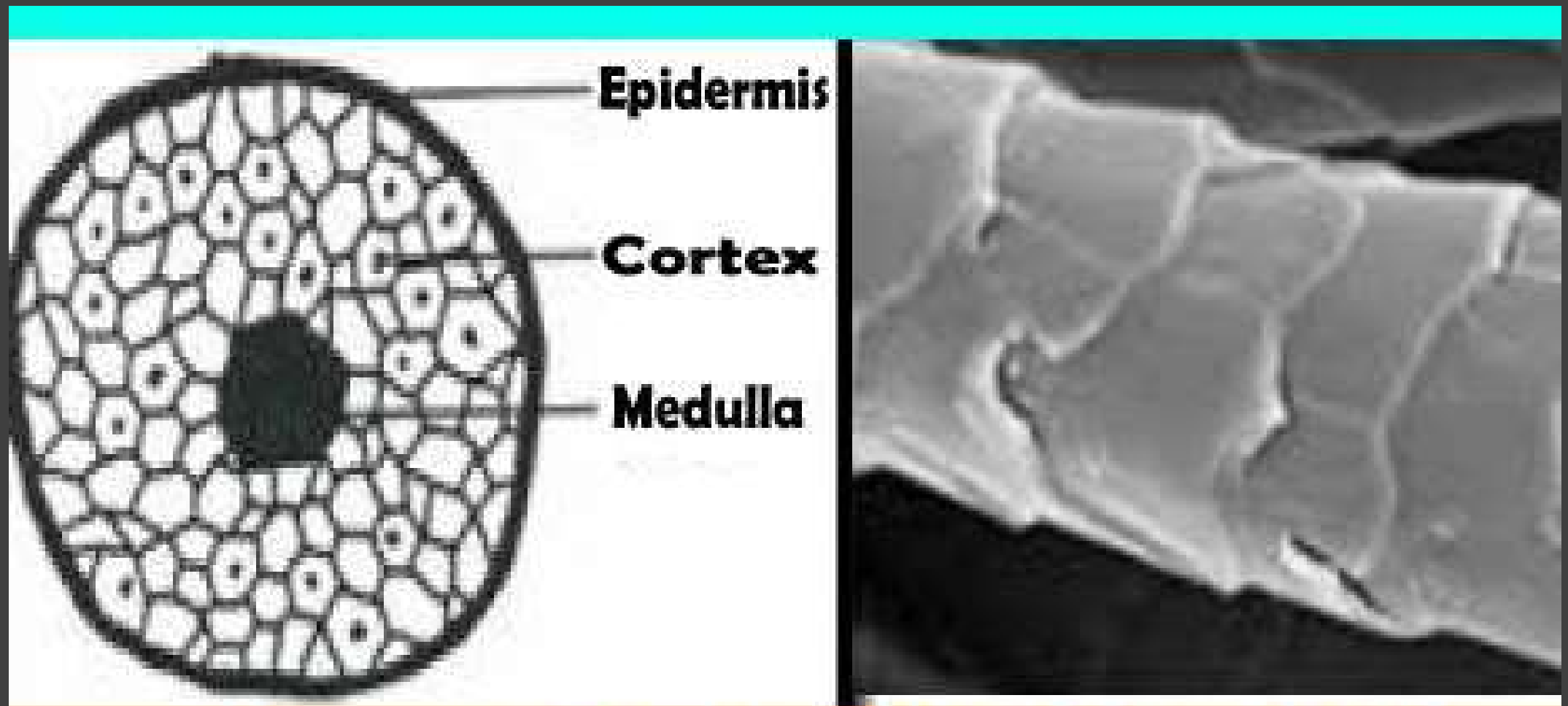
Unmercerised cotton fibre

Mercerised cotton fibre



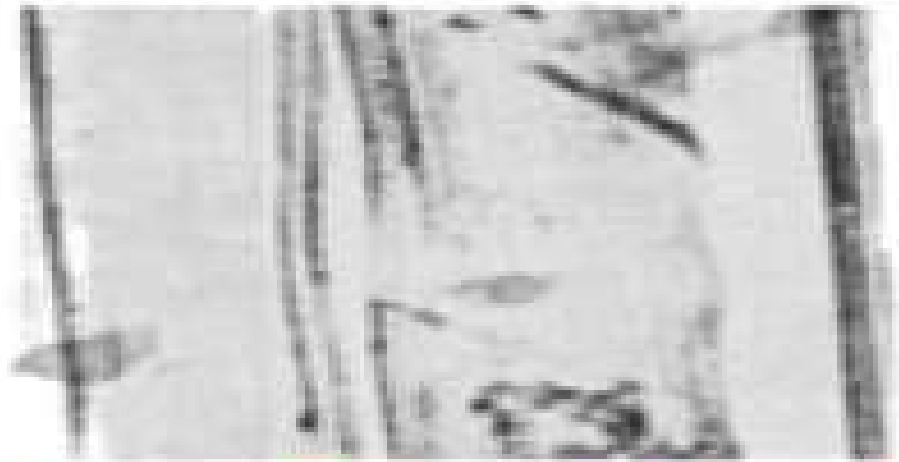
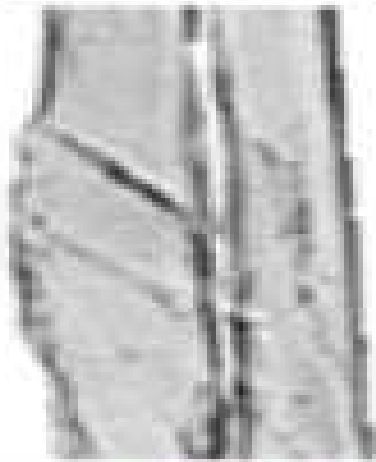
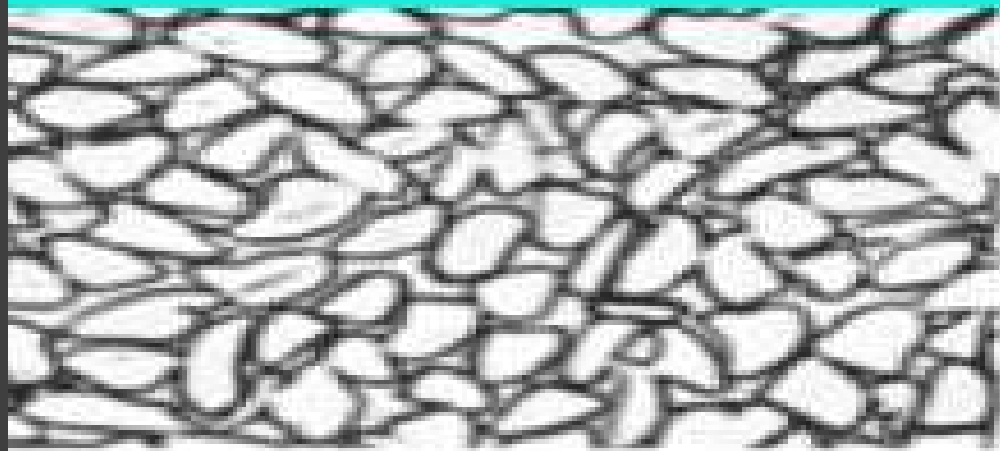
# Οπτική Μικροσκοπία

Μαλλί

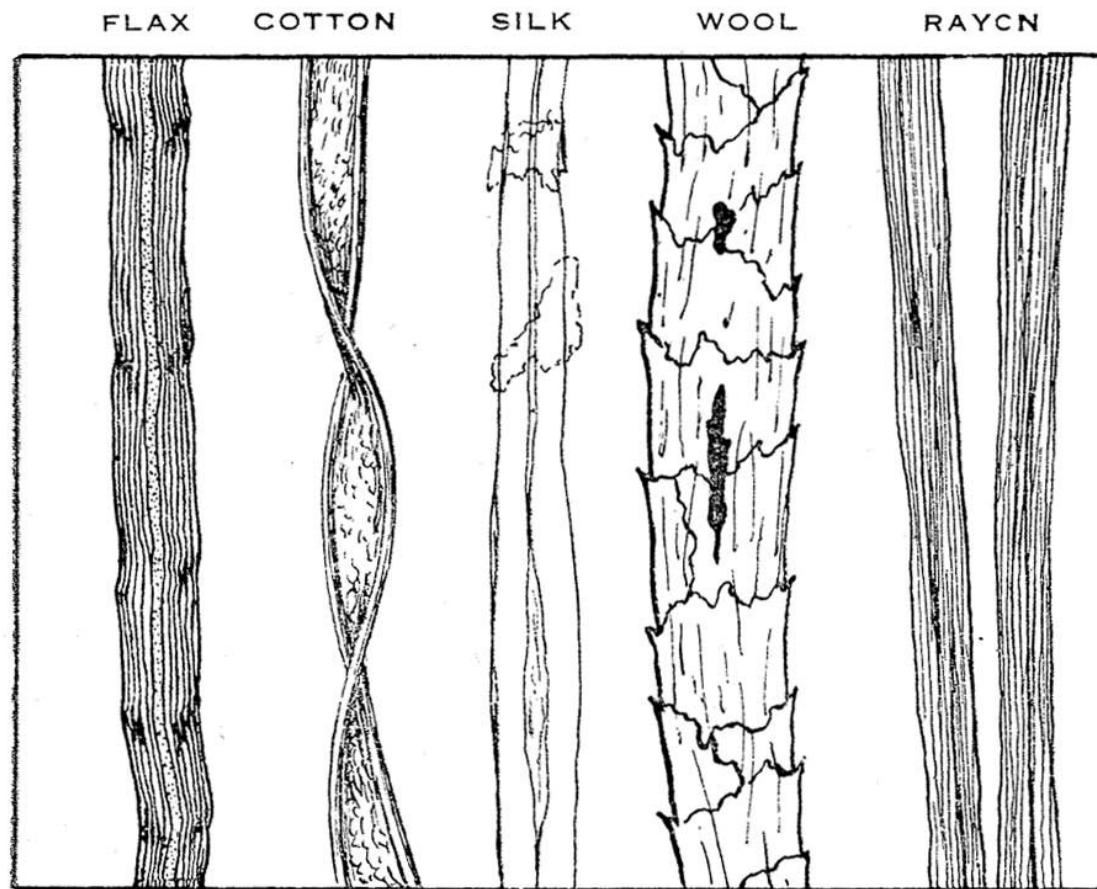


**Cross-sectional and Longitudinal view of Wool**

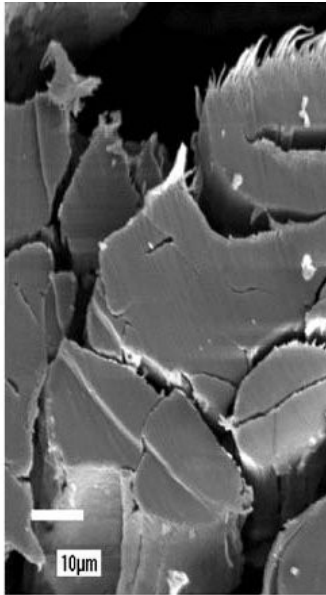
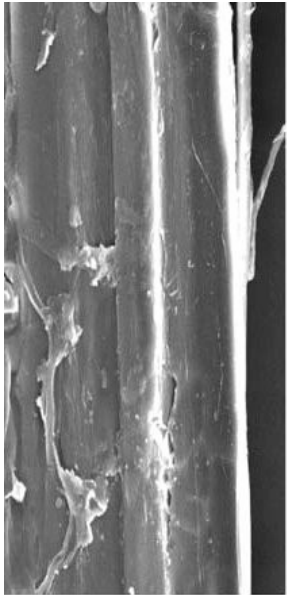




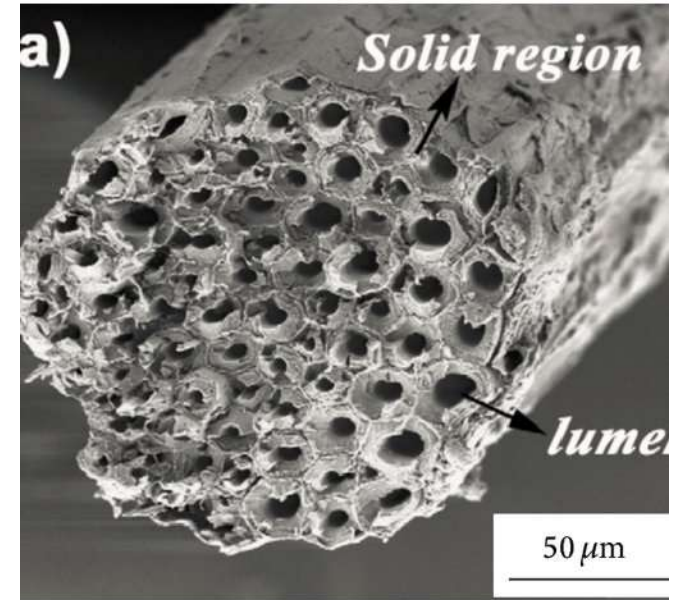
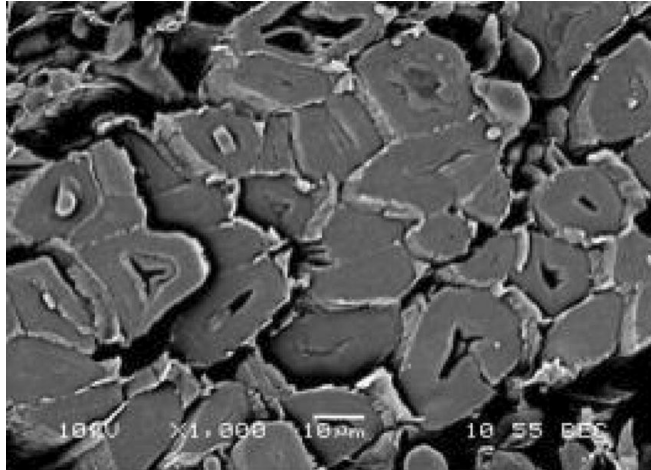
**Cross-sectional and Longitudinal view of Silk and Tussah Silk**



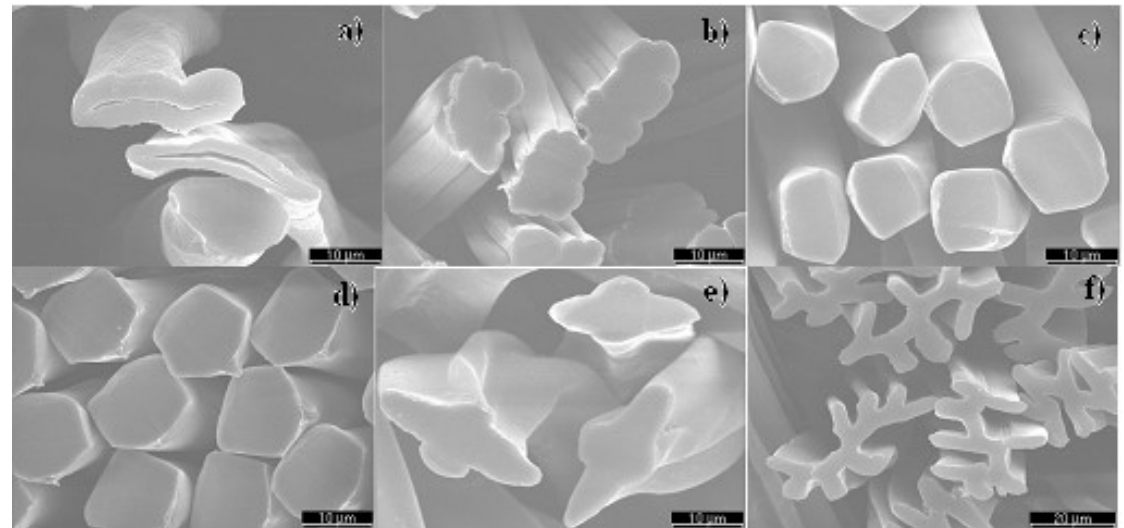
*Fig. 1, Fibres. Longitudinal*

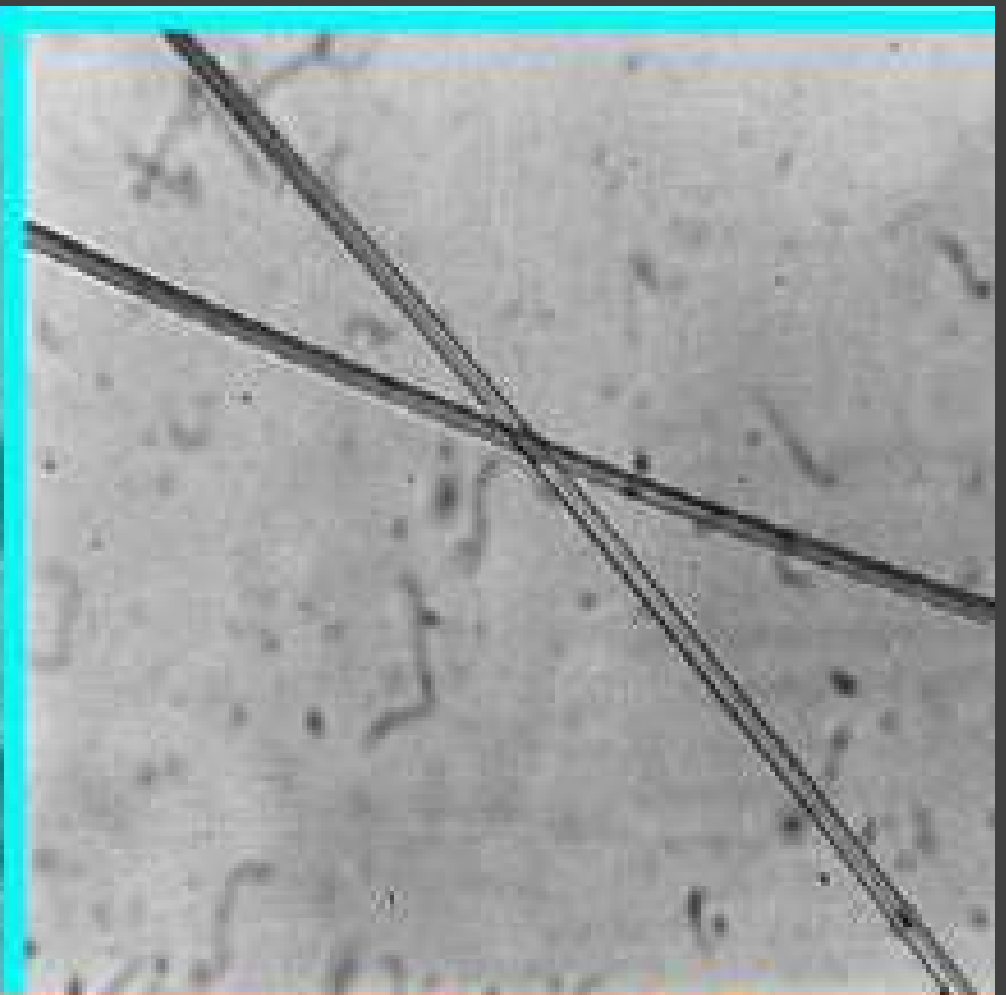
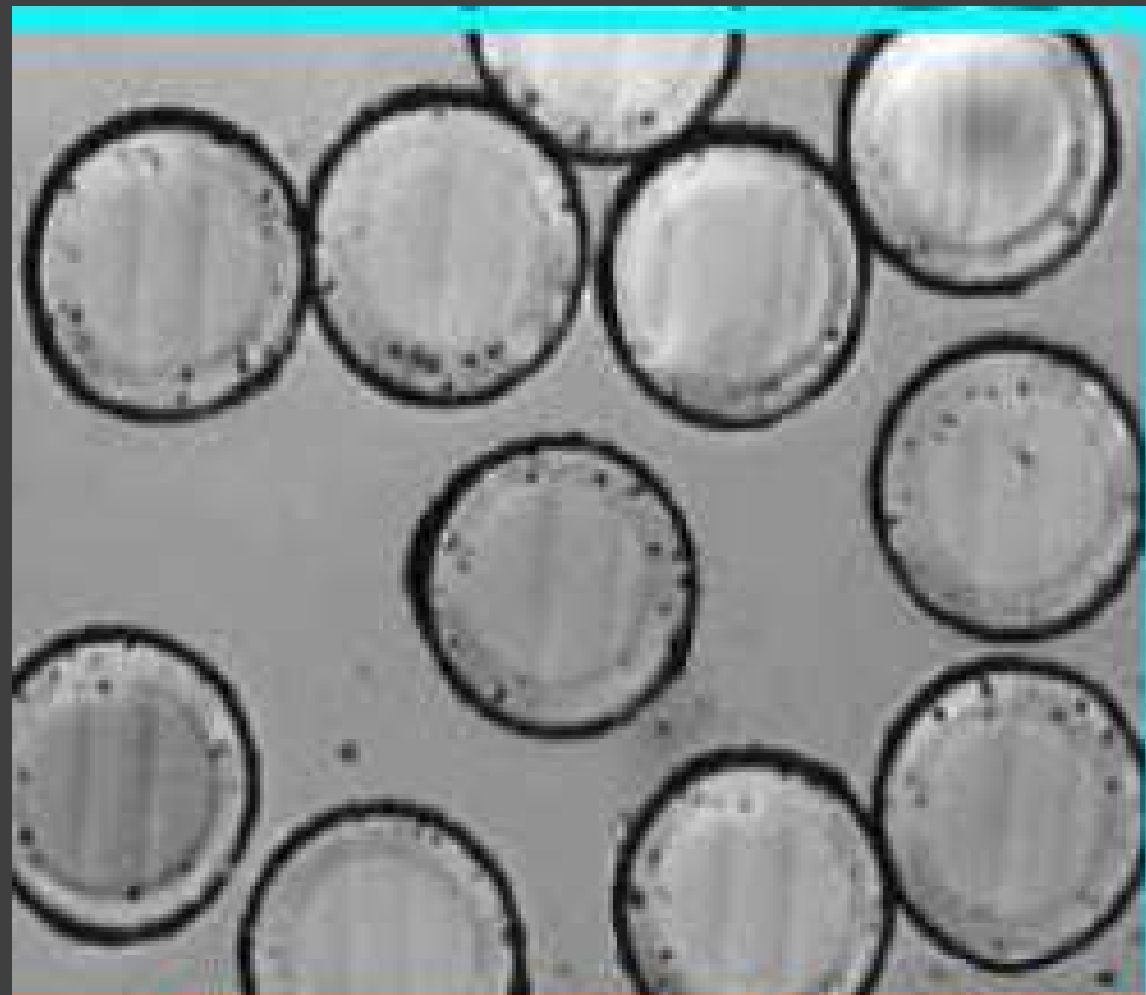


(b)

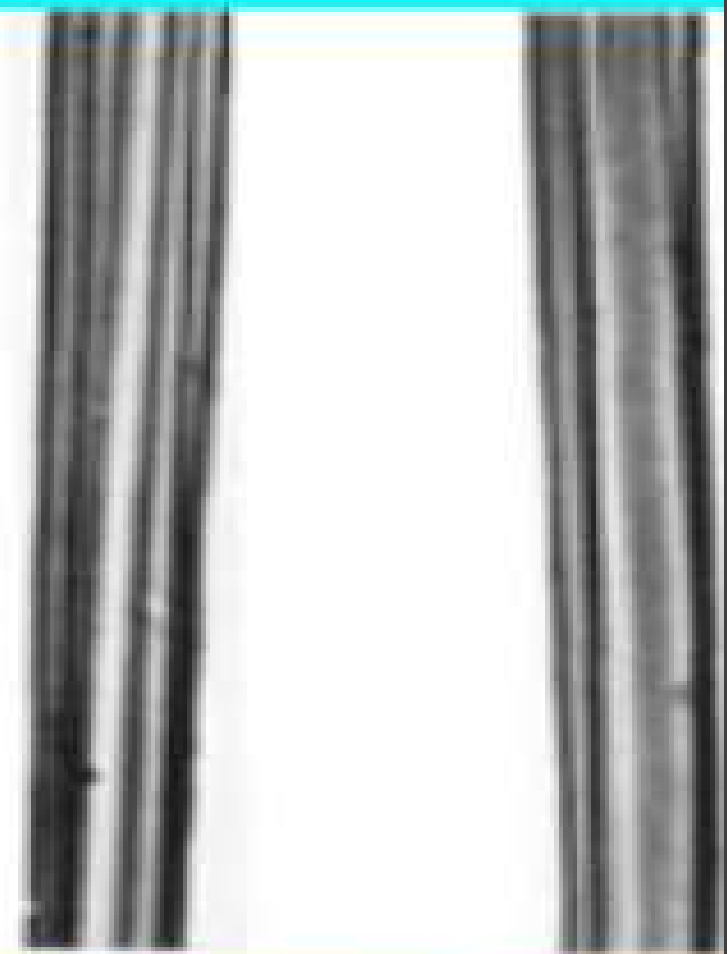
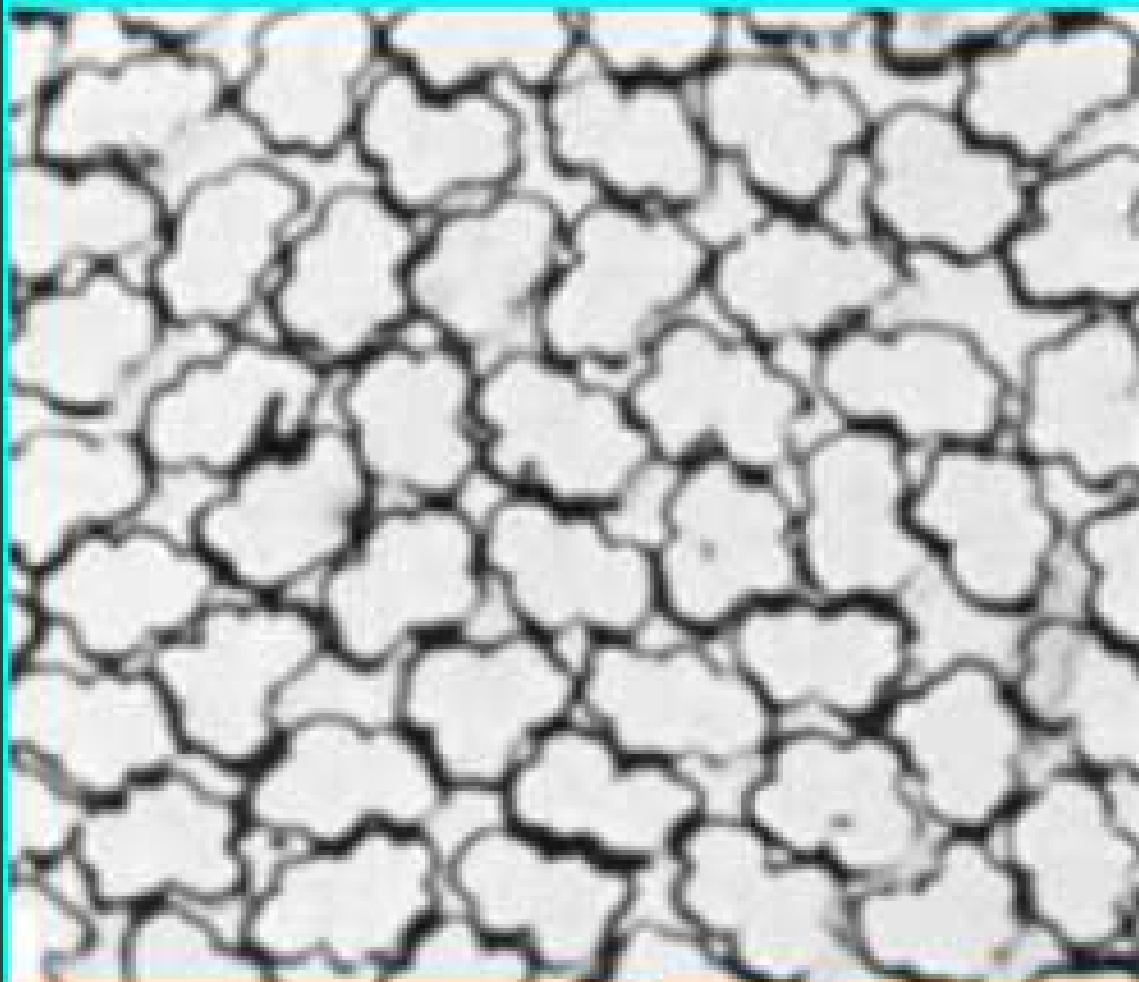


- Cross-section view of the different fibres: a) Cotton; b) Bamboo Viscose; c) Lyocell; and Polyester: c) round section; d) Coolever<sup>®</sup>; e) 4-DG<sup>®</sup>.

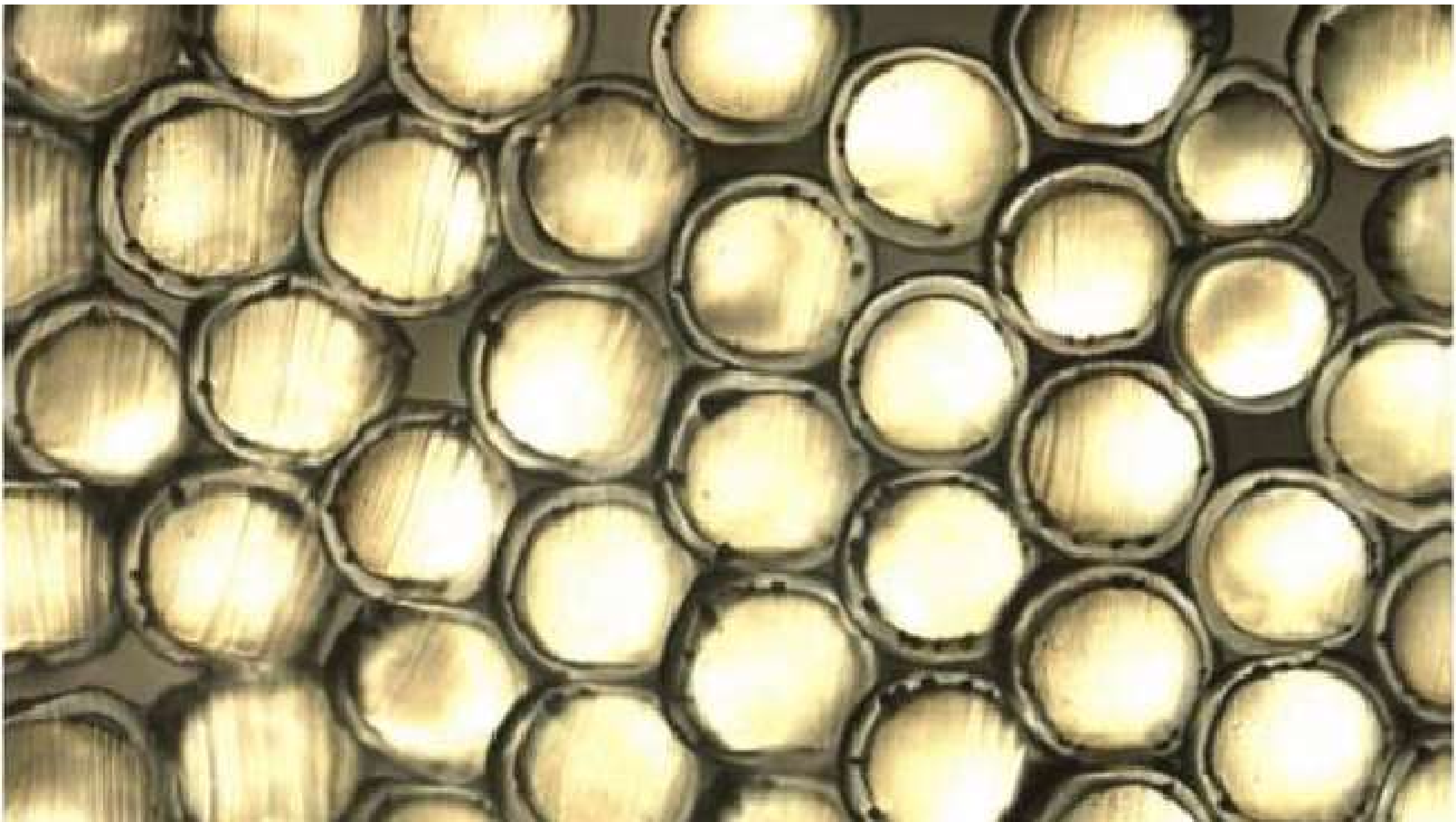




*Cross-sectional and Longitudinal view of Rayon*



*Cross-sectional and Longitudinal view of Acetabular Cartilage*



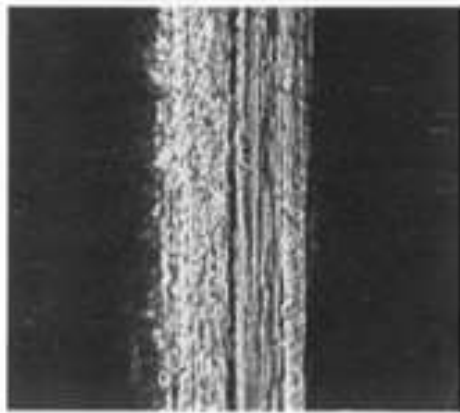
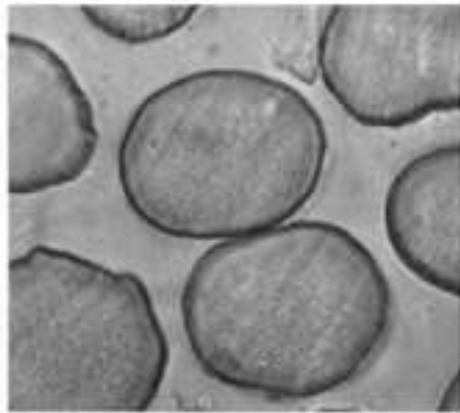


Fig. 16 Modacrylic

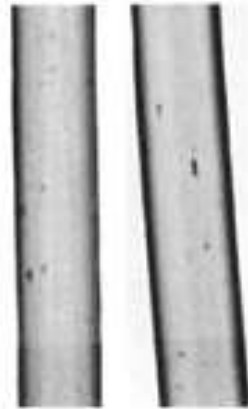
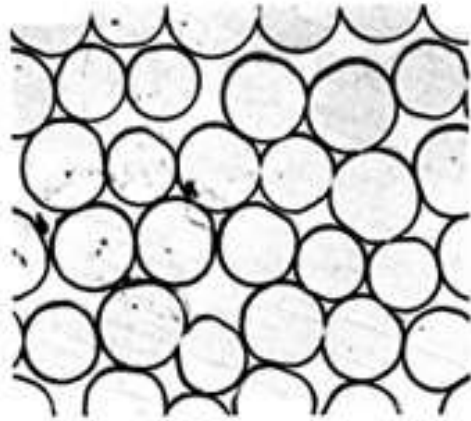


Fig. 17 Nylon, bright

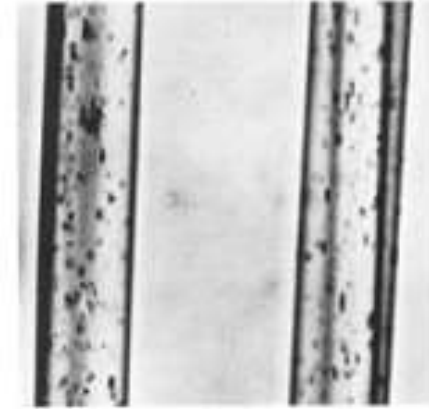
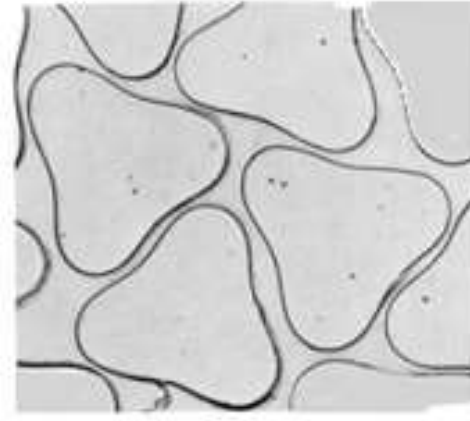
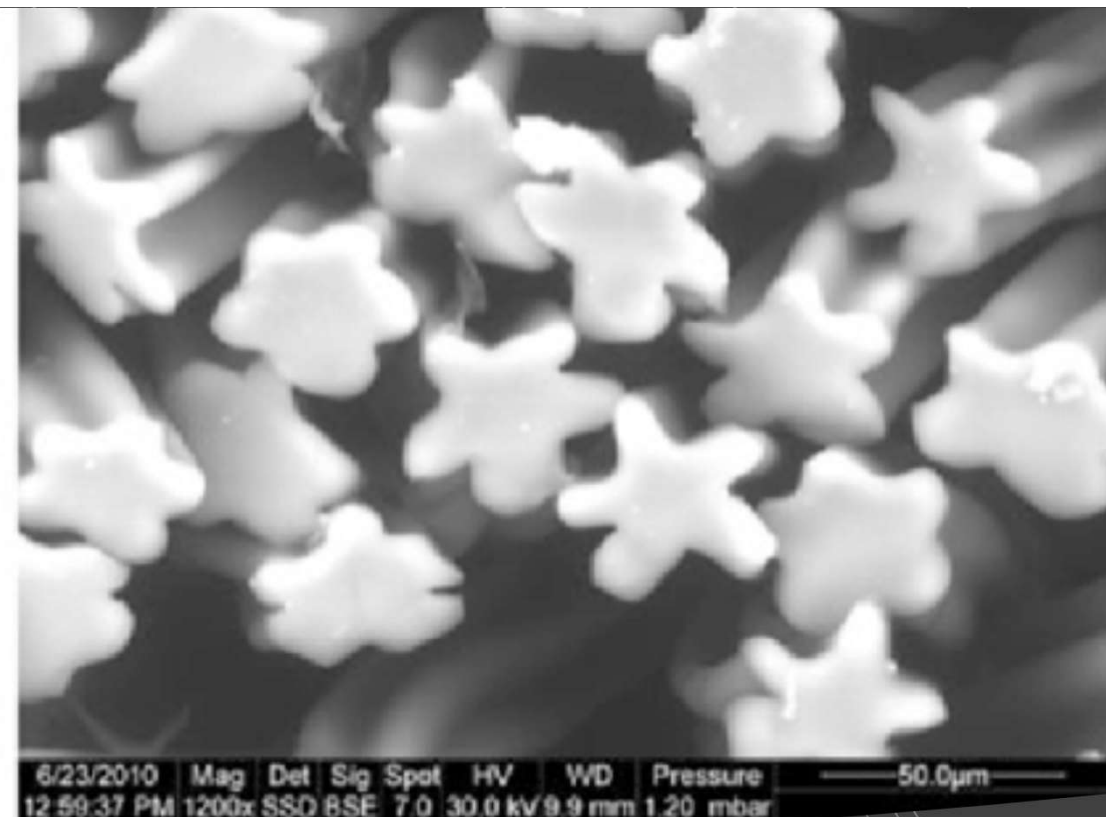
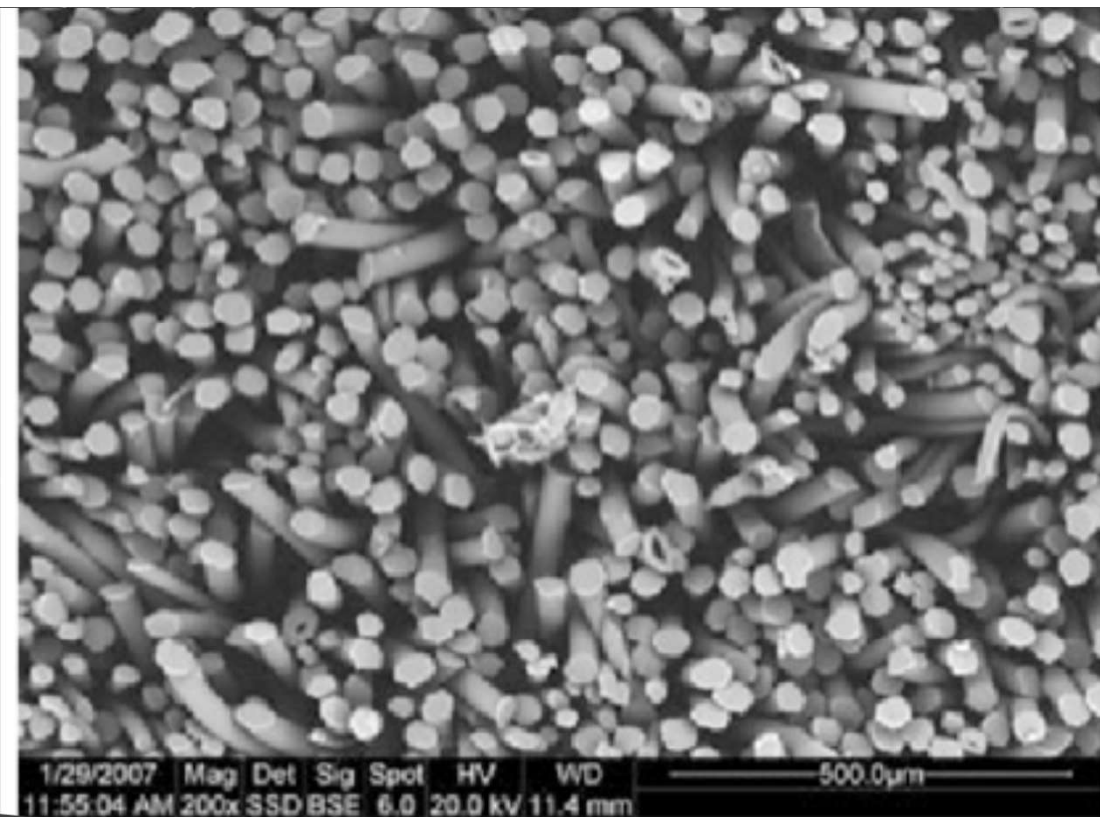


Fig. 18 Nylon, Low modification ratio, trilobal





- Scanning electron microscope images of samples of fibrous sound absorbers: a fibre orientation of a cross section perpendicular to the face of a polyester nonwoven textile, b pentalobe cross-sectional shape of a man-made fibre (courtesy of J. Alba and R. del Rey, Polytechnic University of Valencia)

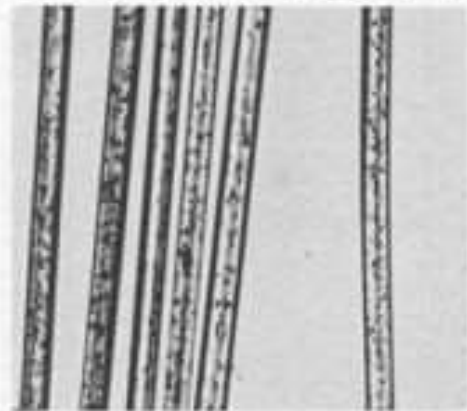
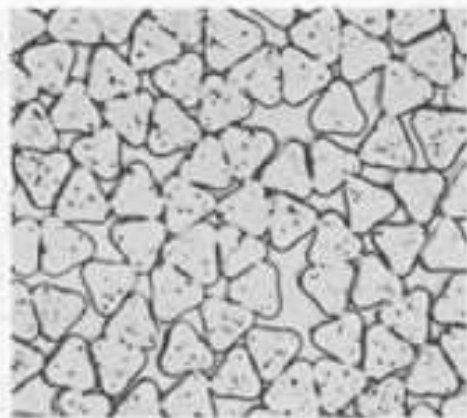


Fig. 22 Polyester, low modification ratio trilobal, 1.4 denier per filament, semi-dull luster

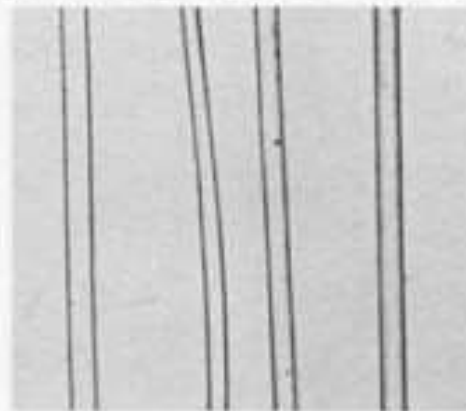
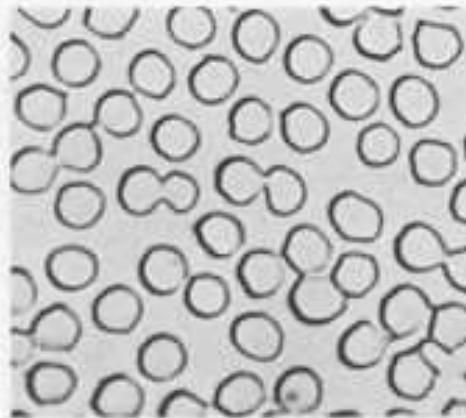


Fig 23 Rayon, cuprammonium 1.3 denier per filament, bright luster

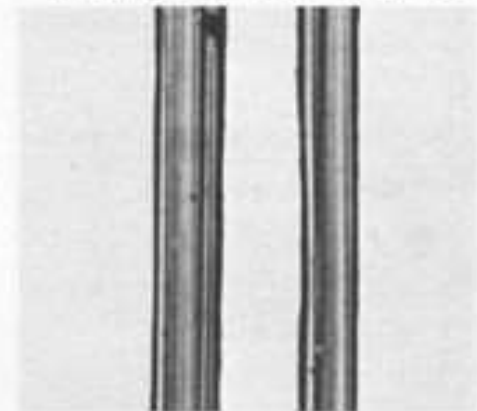
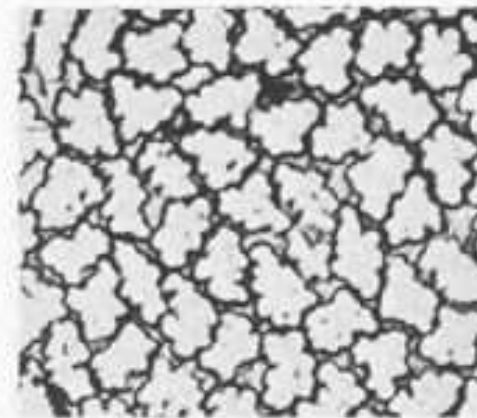
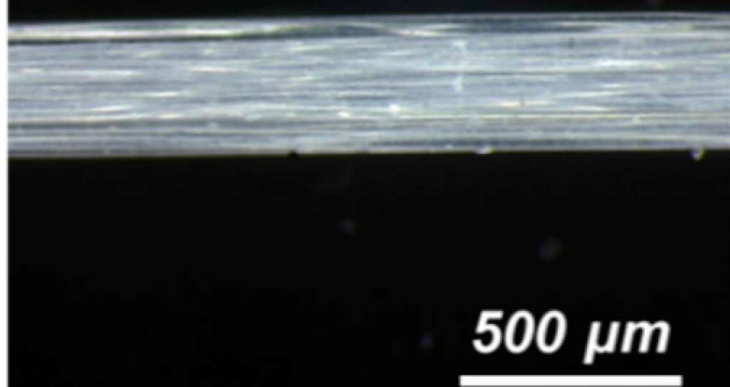
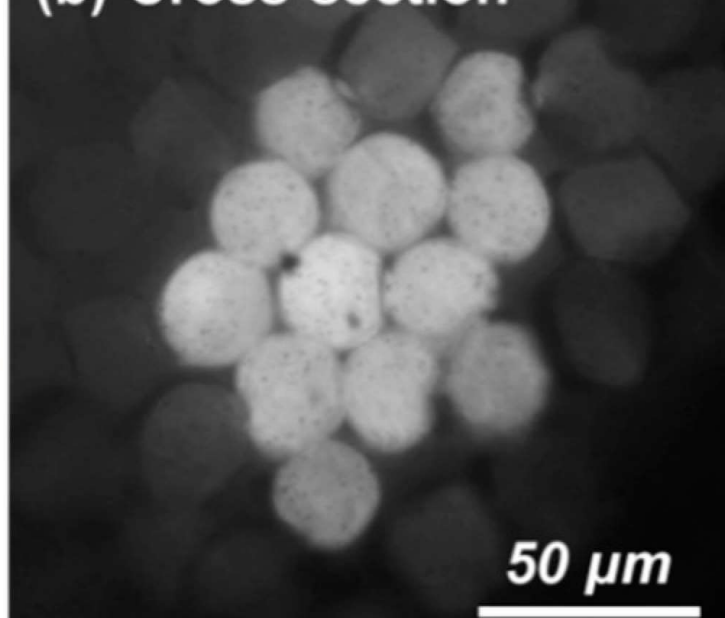


Fig. 24 Rayon, viscose, Regular tenacity

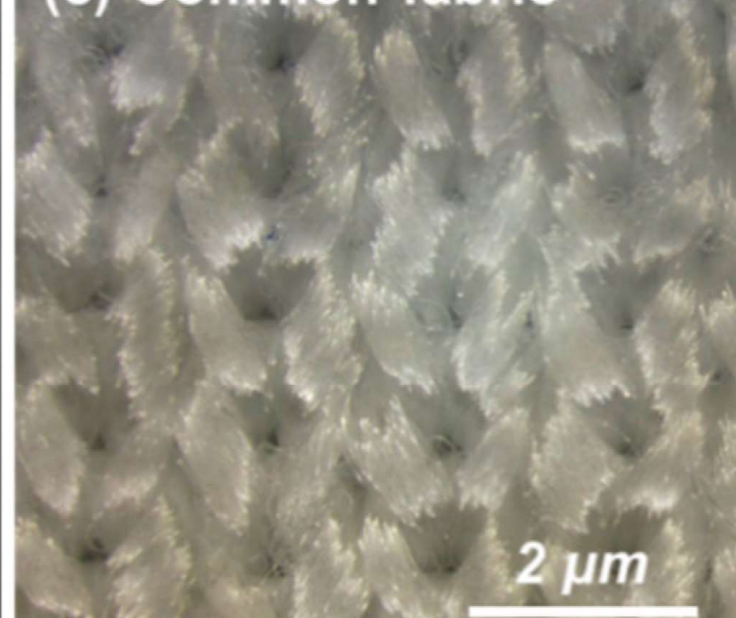
**(a) Circular fiber 44/34**



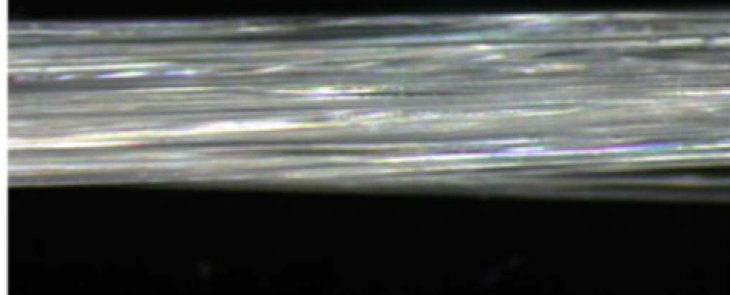
**(b) Cross-section**



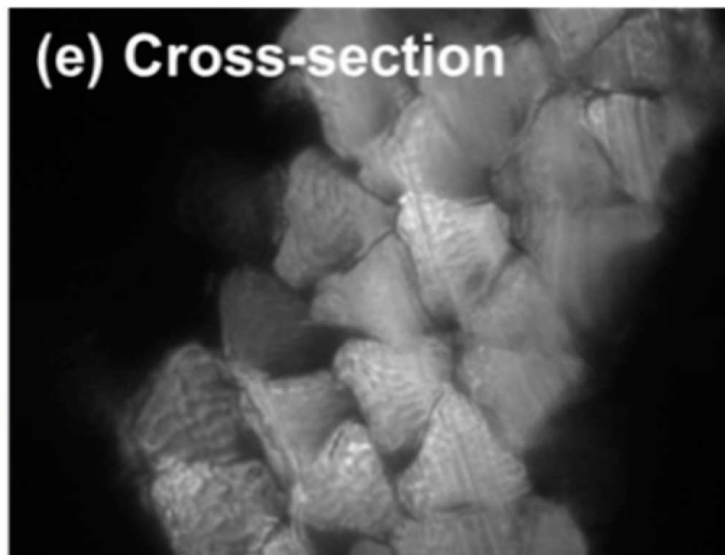
**(c) Common fabric**



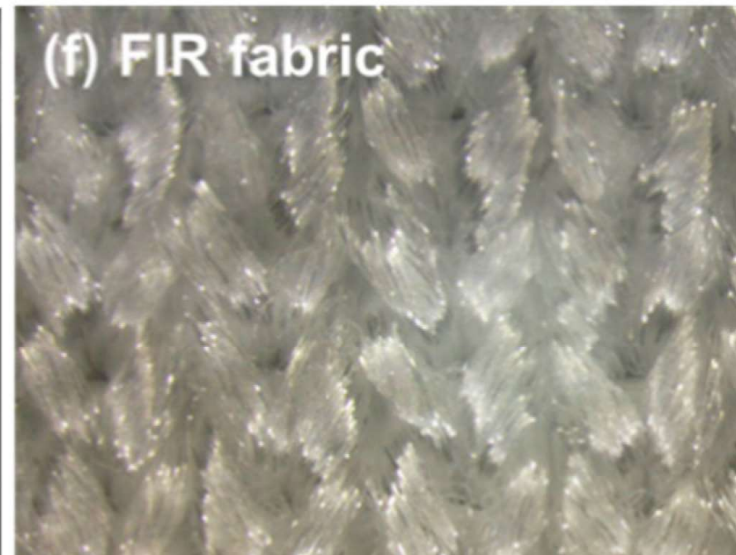
**(d) Triangular fiber 44/34**



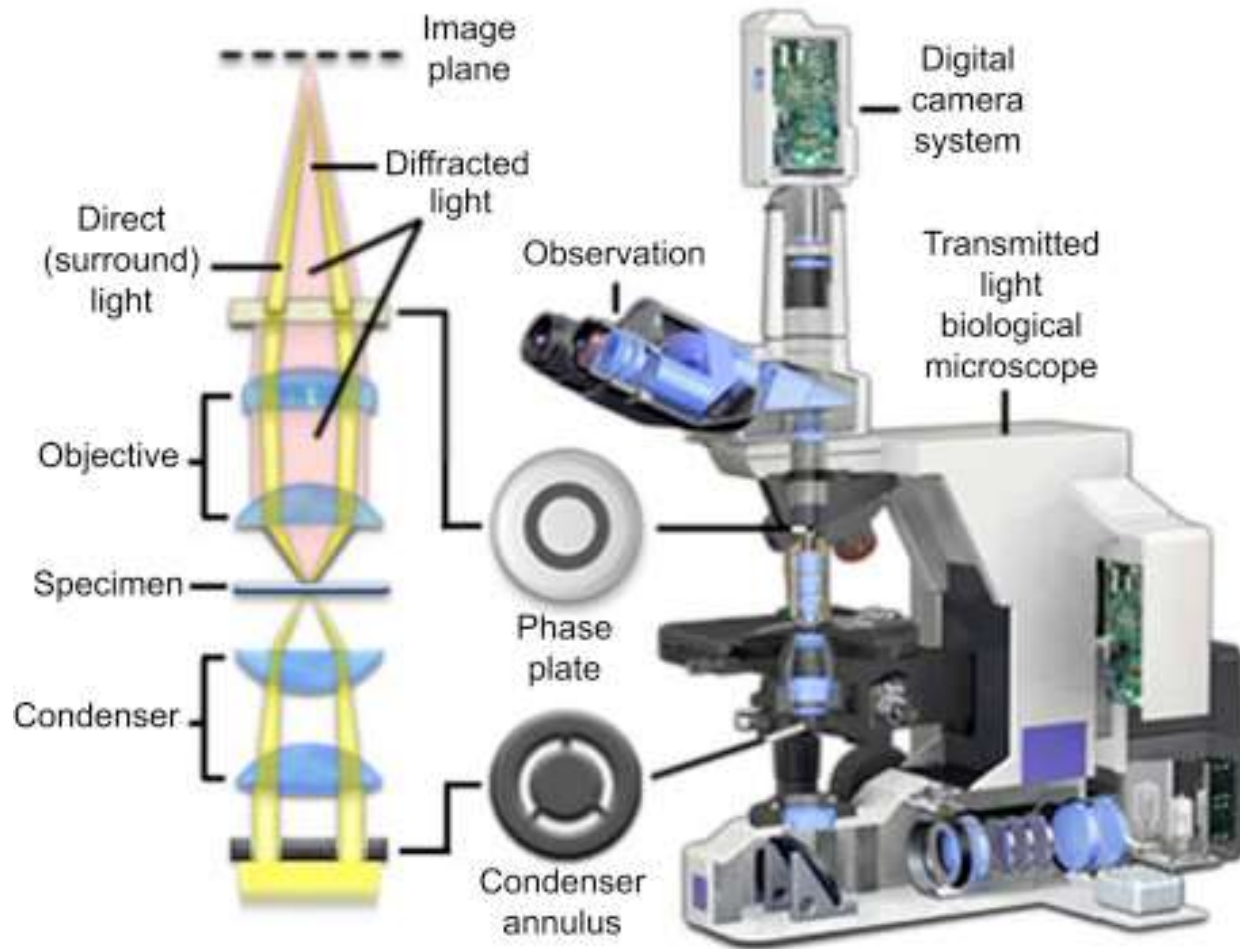
**(e) Cross-section**



**(f) FIR fabric**



### Phase contrast microscope configuration



60 mJ/cm<sup>2</sup> 1 pulse



(a)

10 μm

400 mJ/cm<sup>2</sup> 1 pulse



(b)

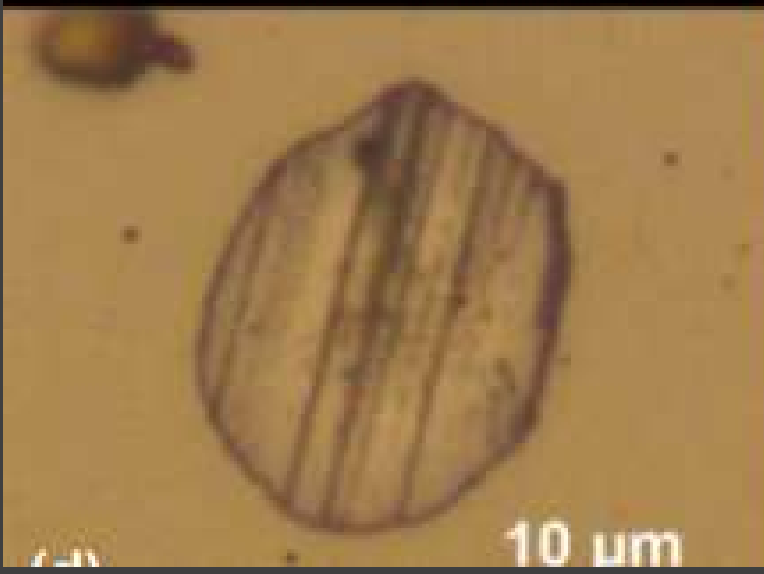
10 μm

82 mJ/cm<sup>2</sup> 2 pulses



(c)

10 μm



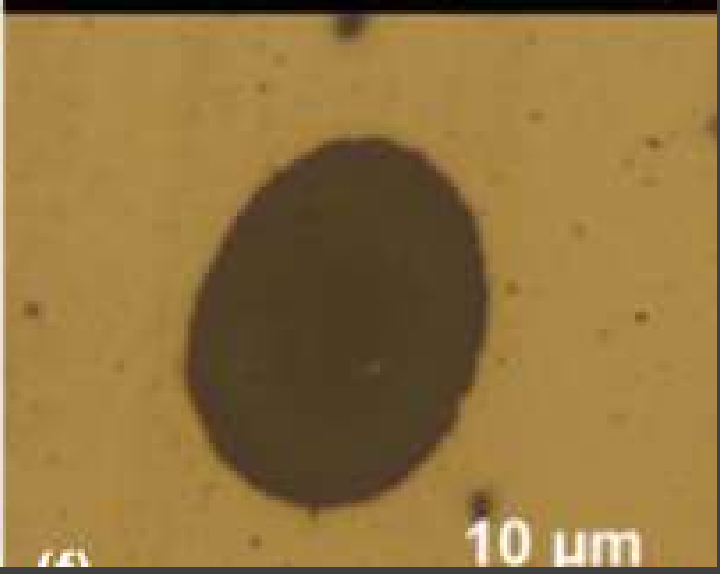
(a)

10 μm



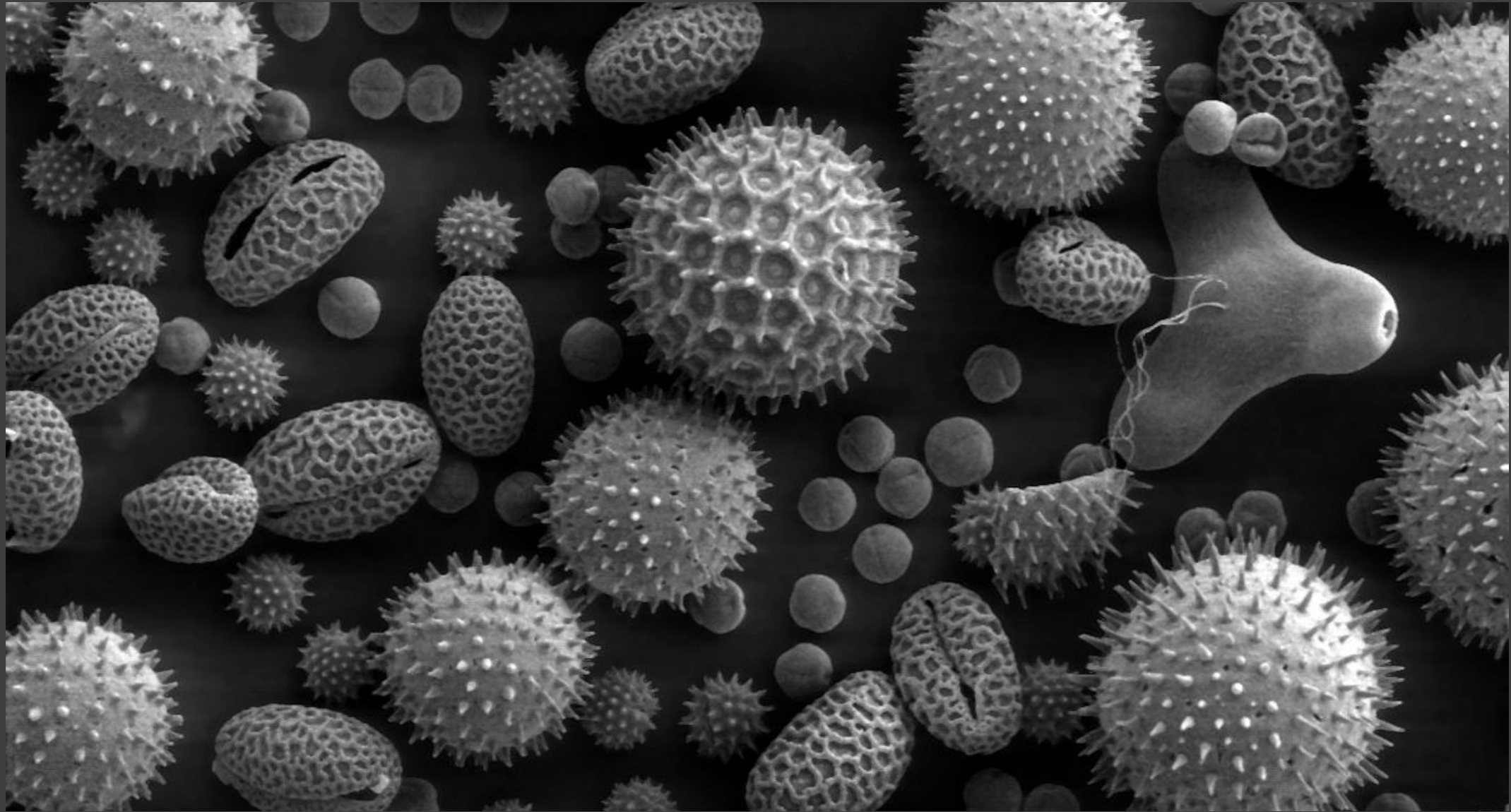
(b)

10 μm

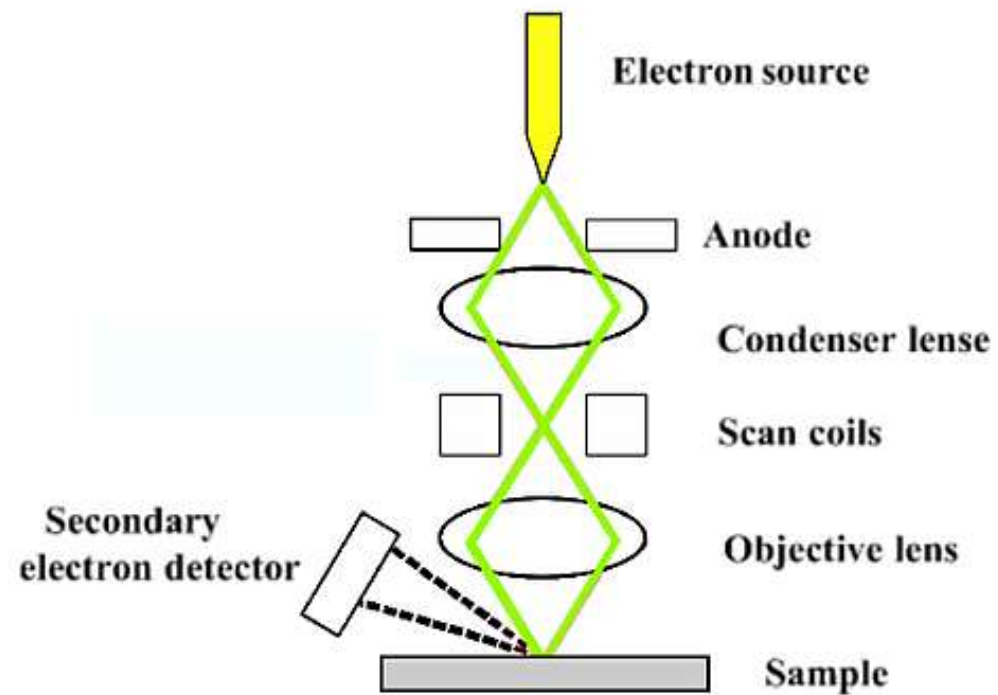


(c)

10 μm

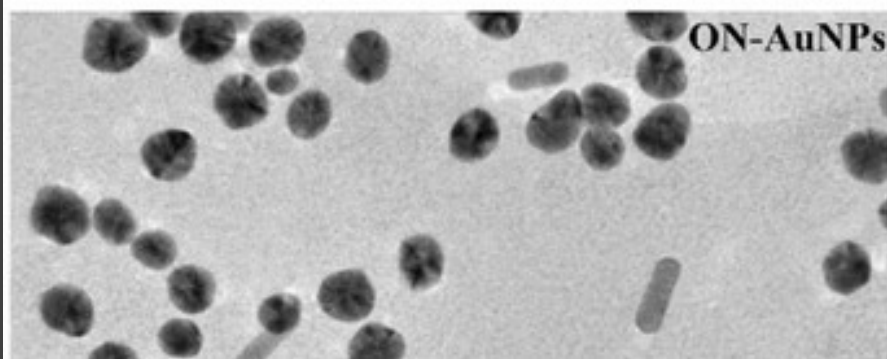
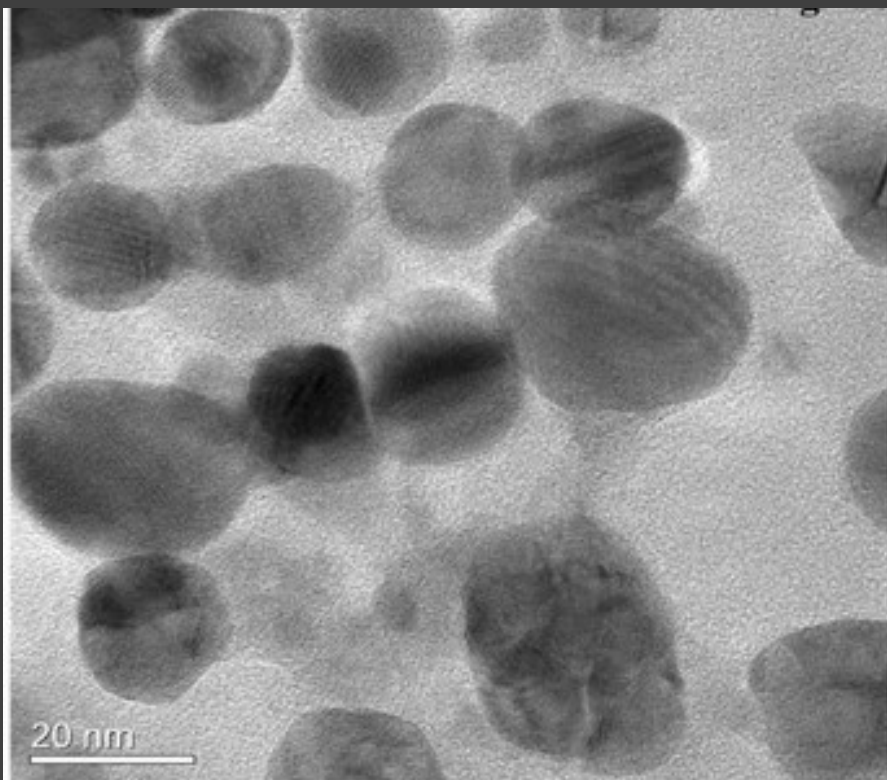


## Scanning Electron Microscope

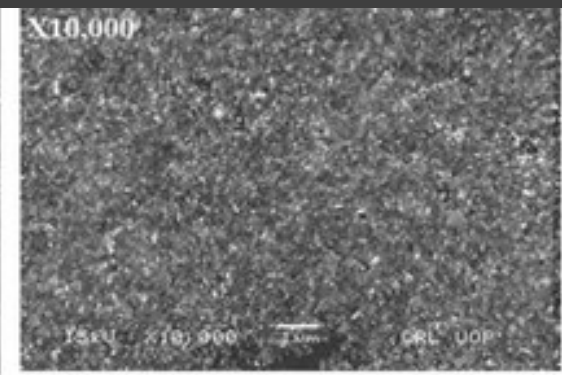
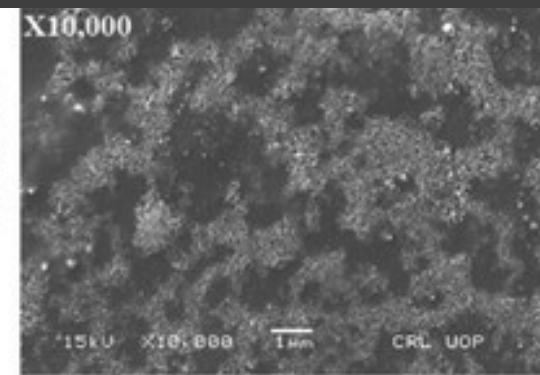




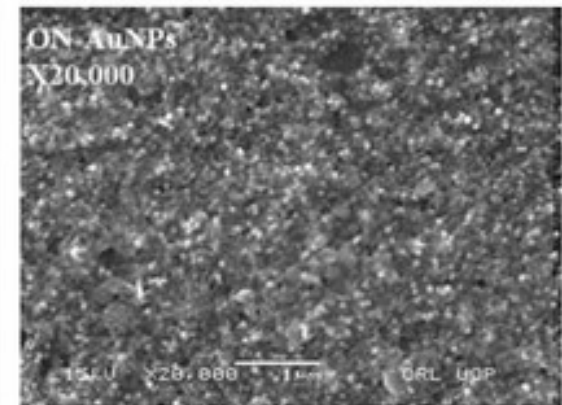
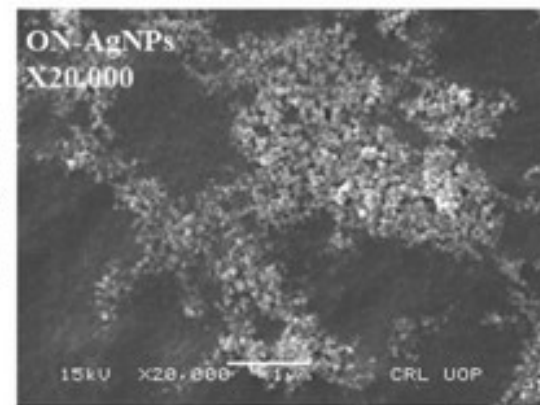




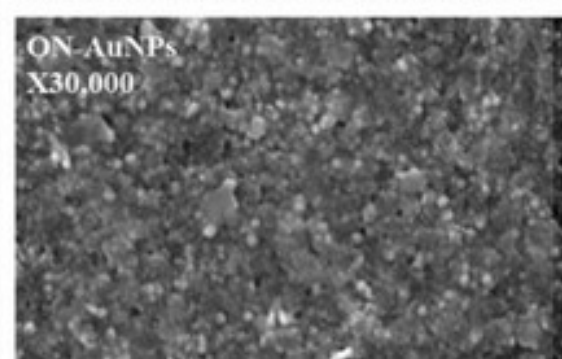
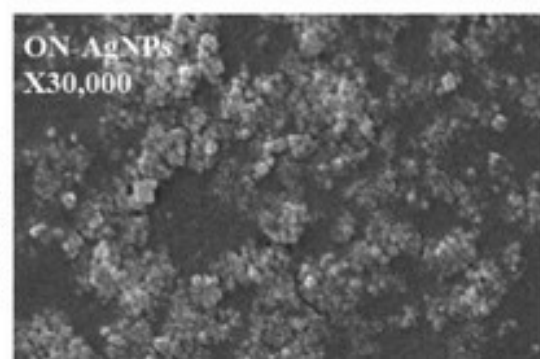
x10,000



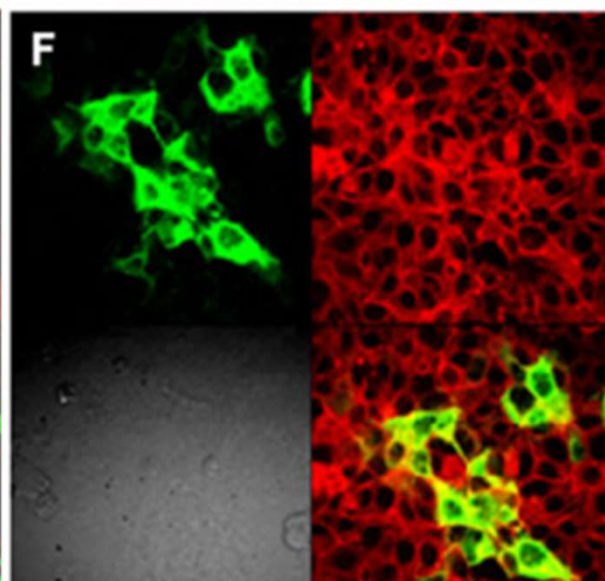
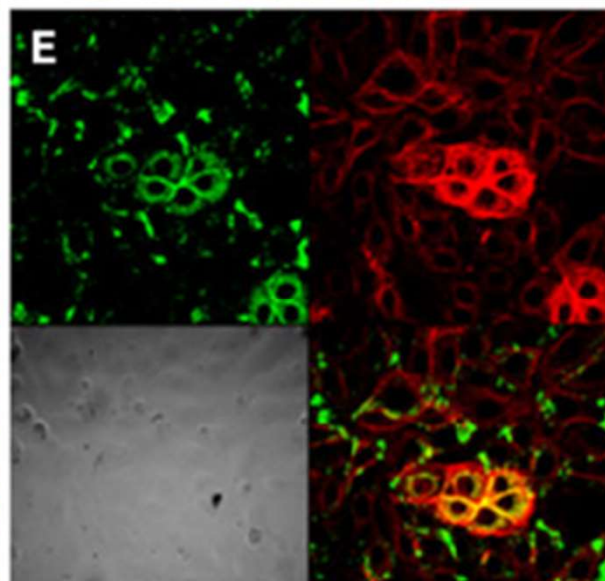
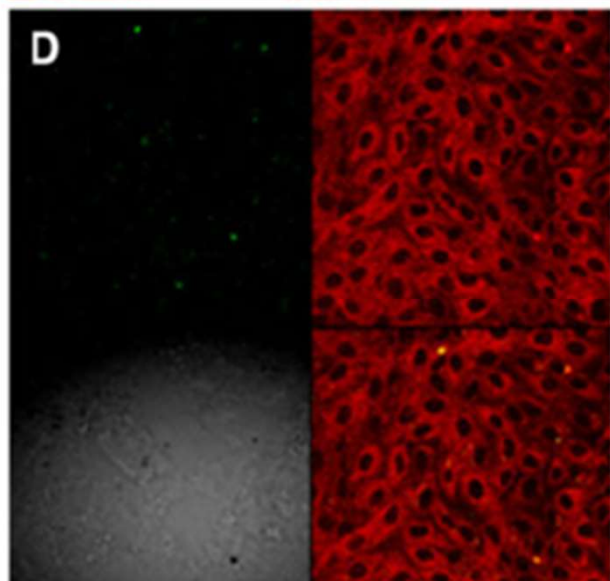
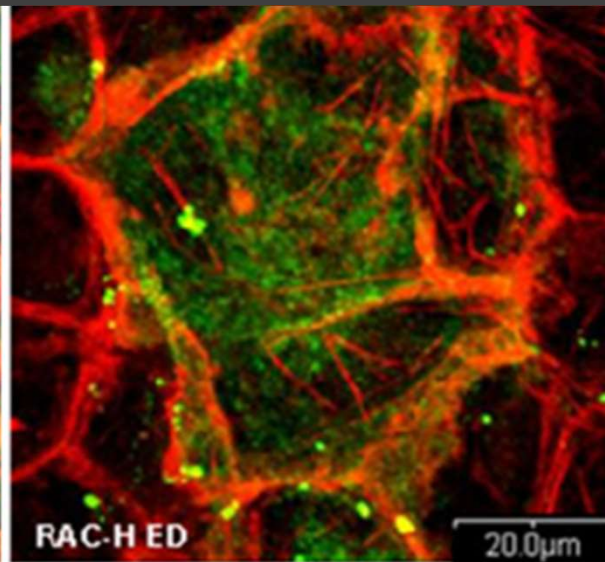
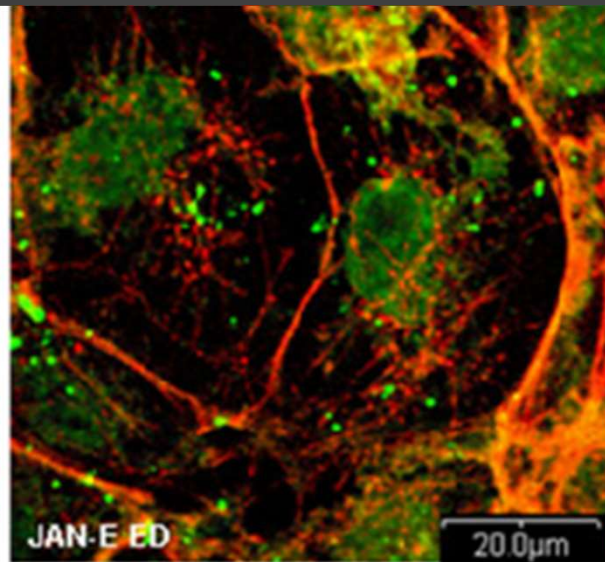
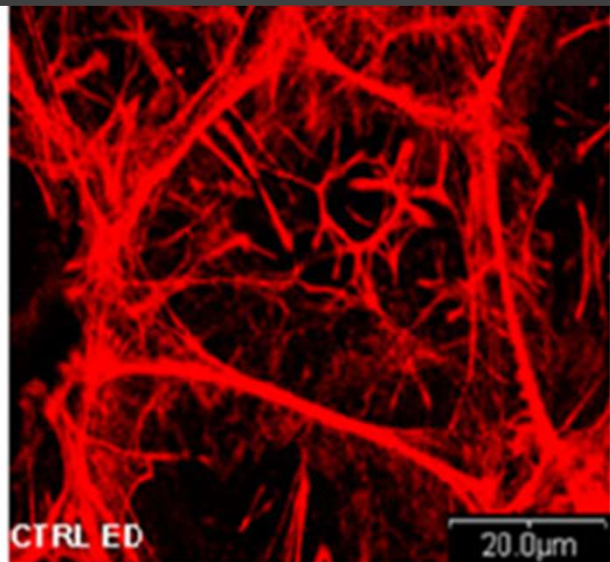
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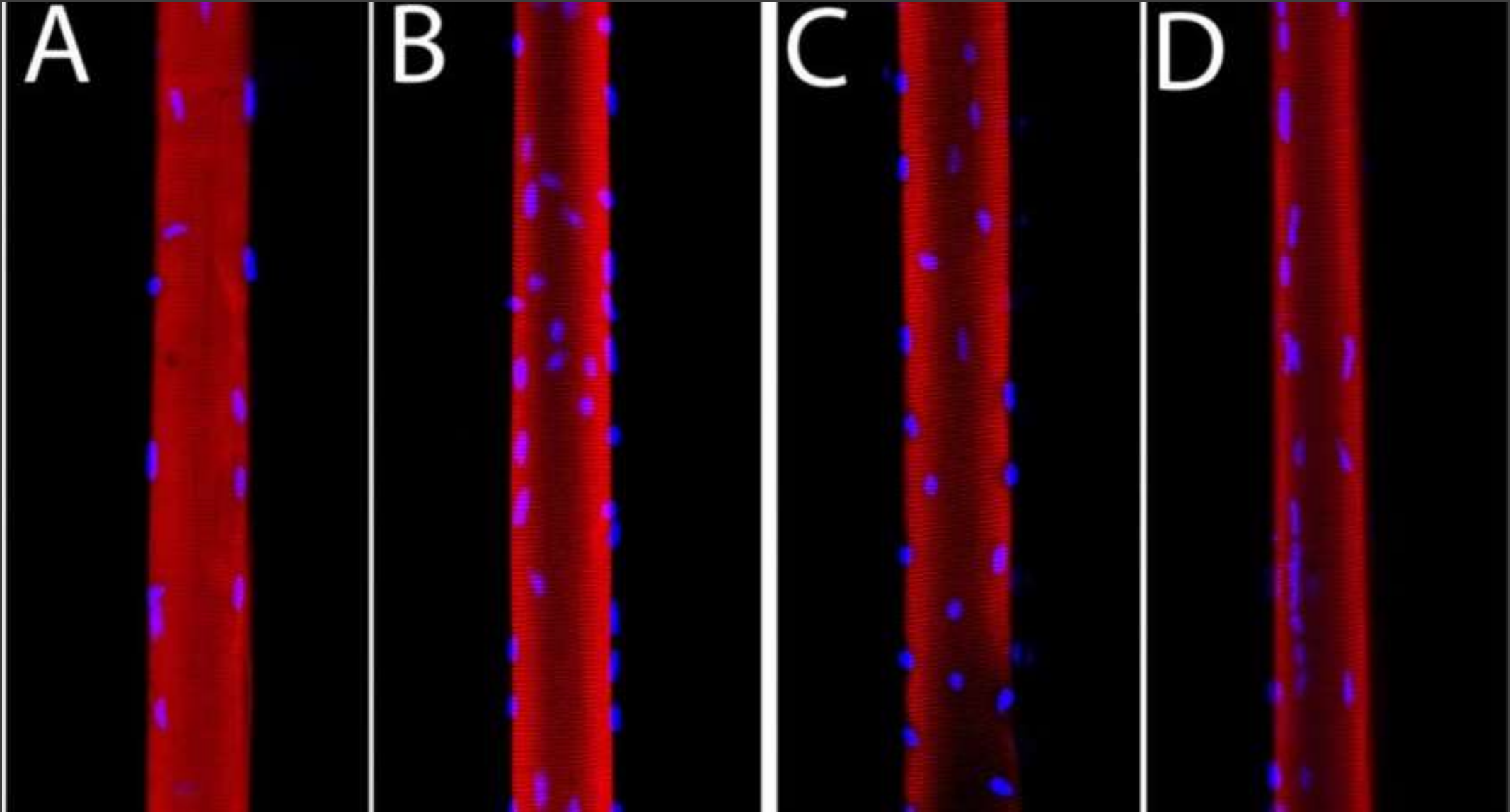


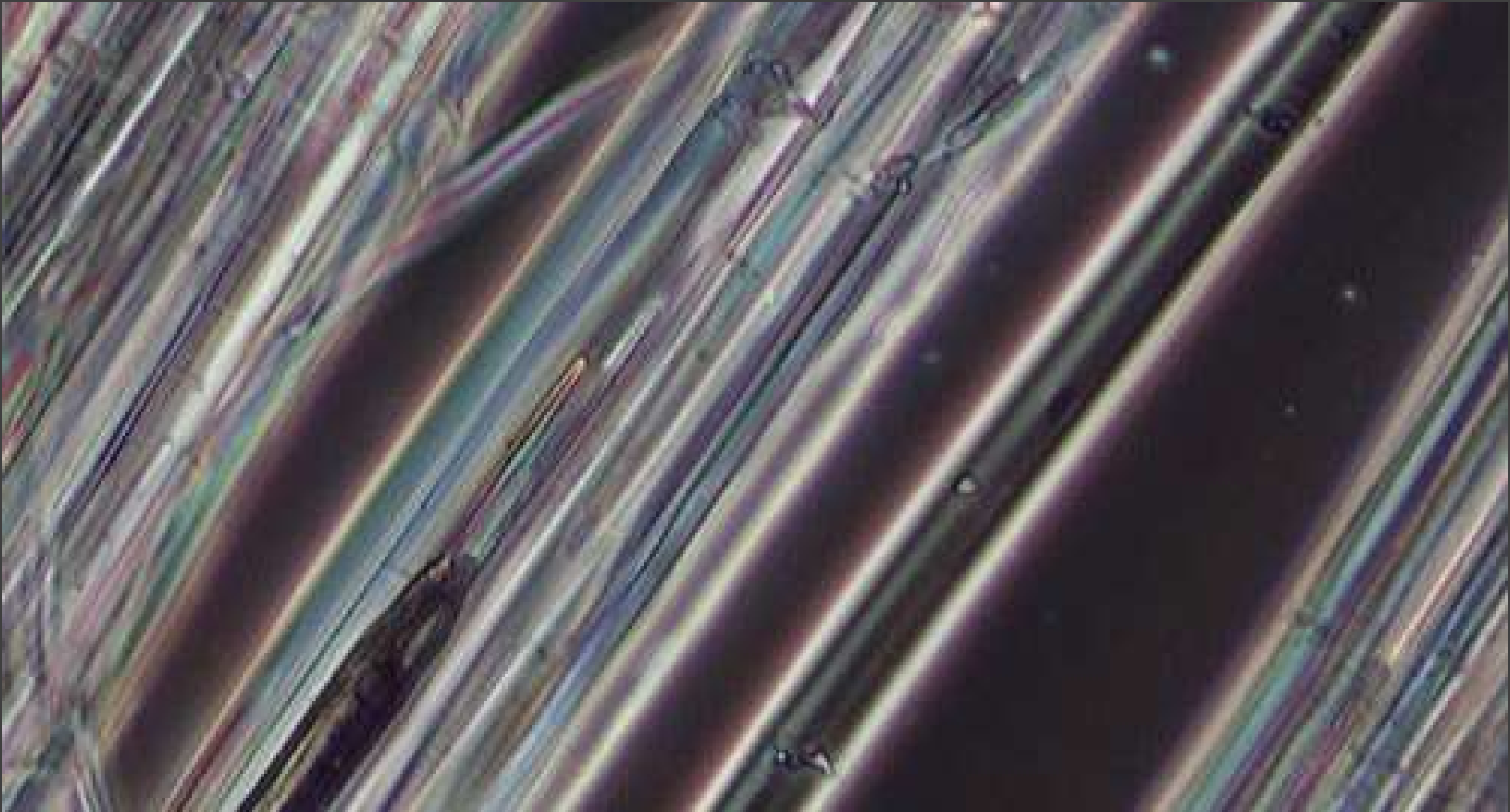
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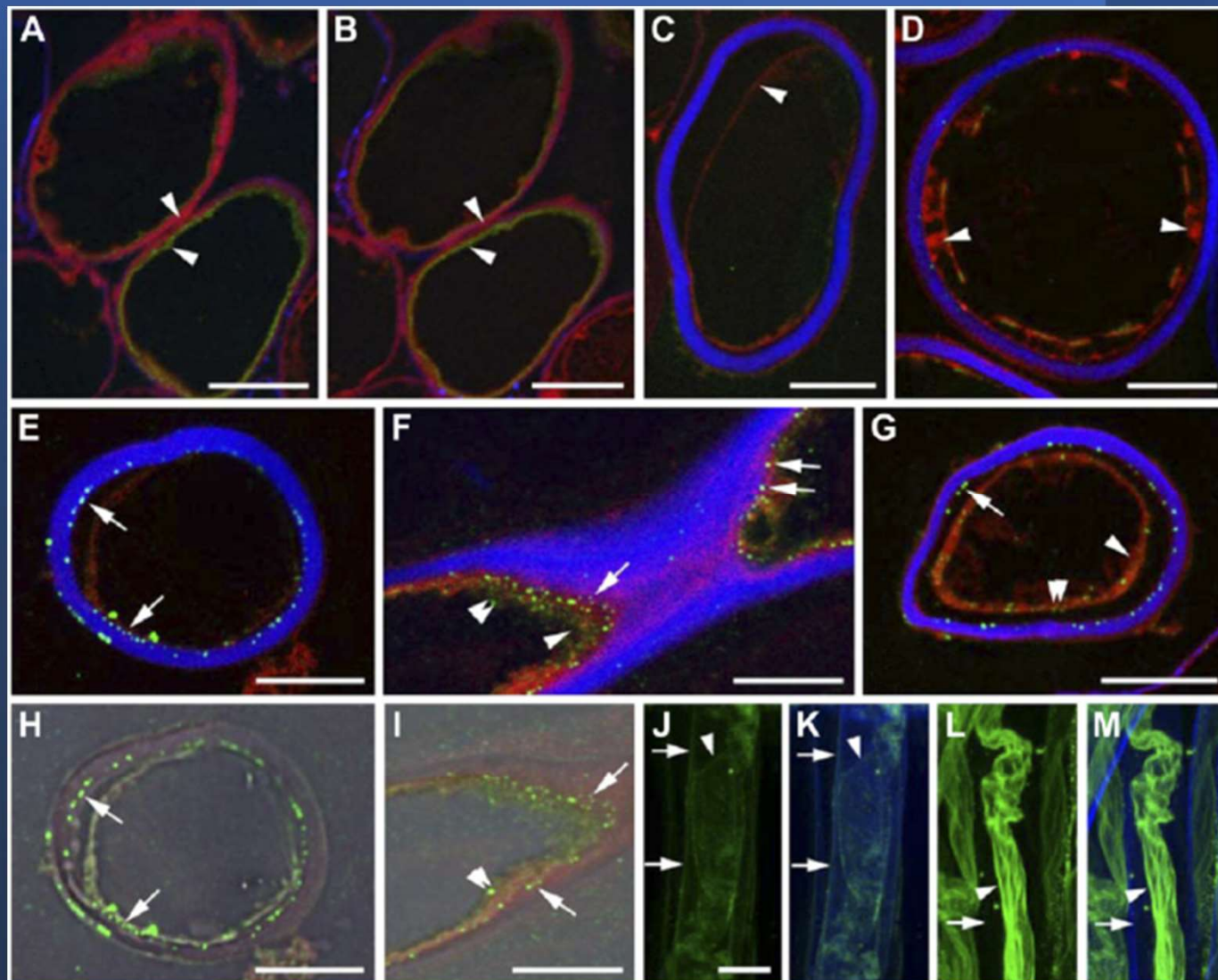


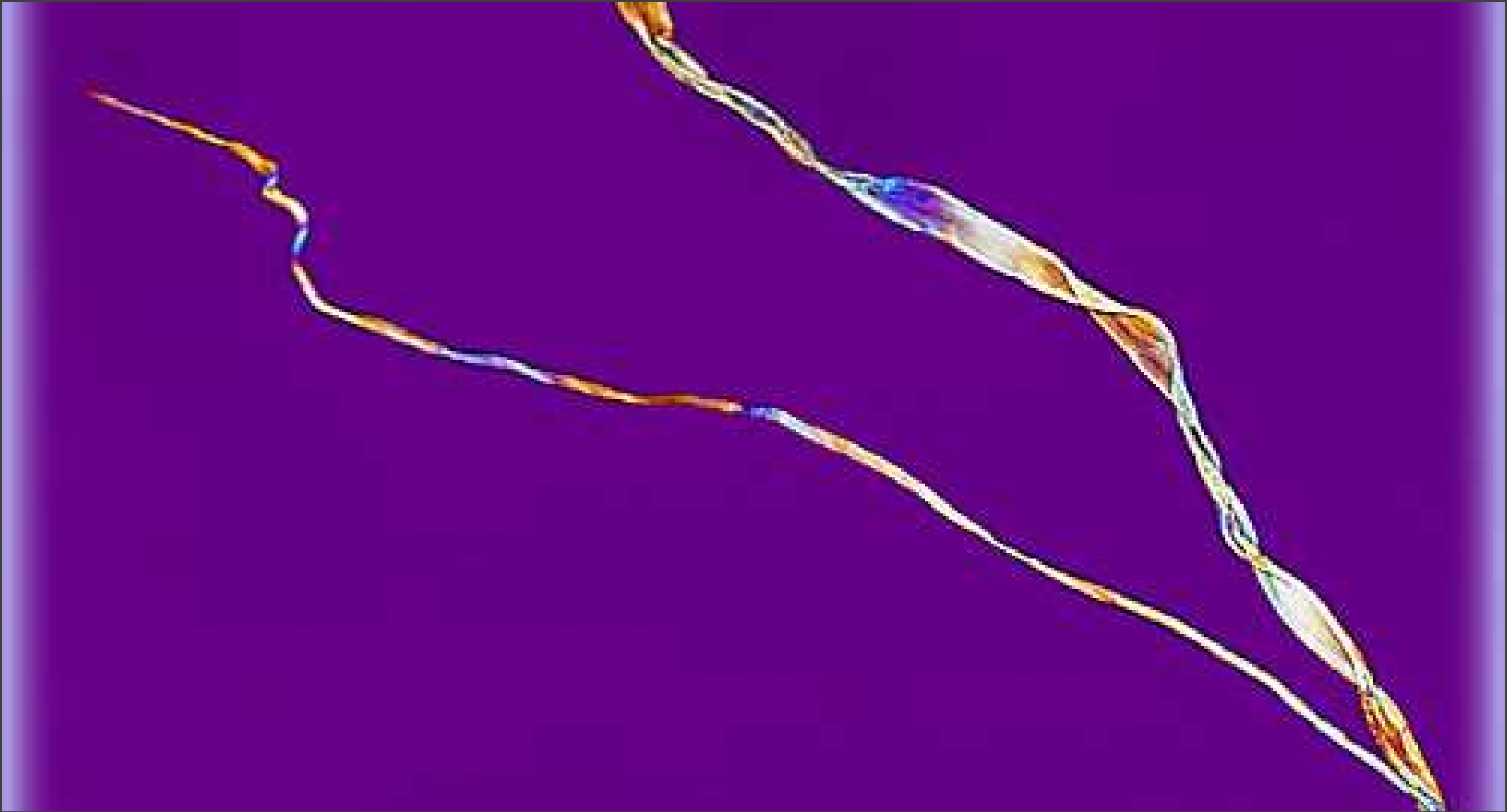






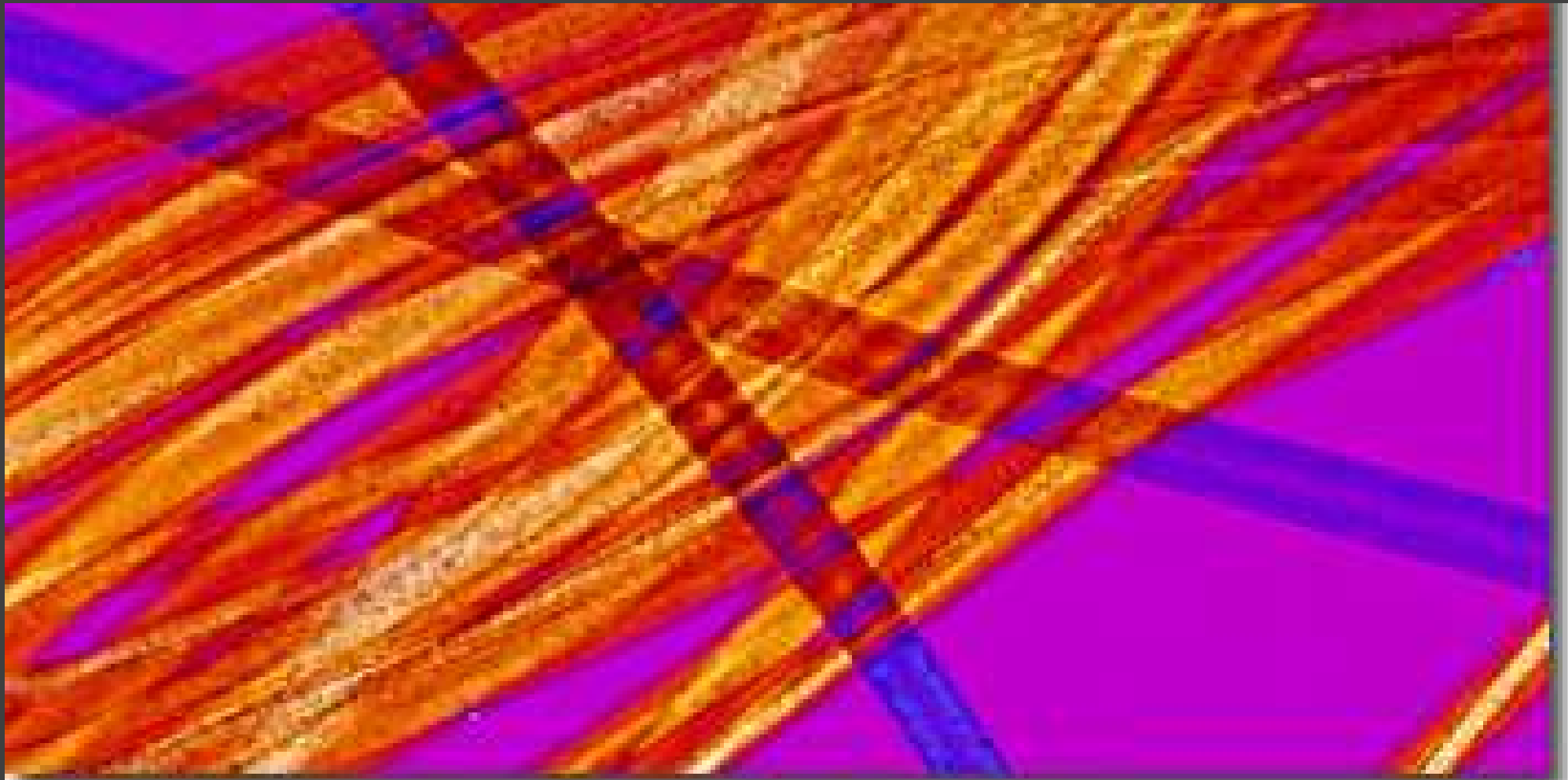


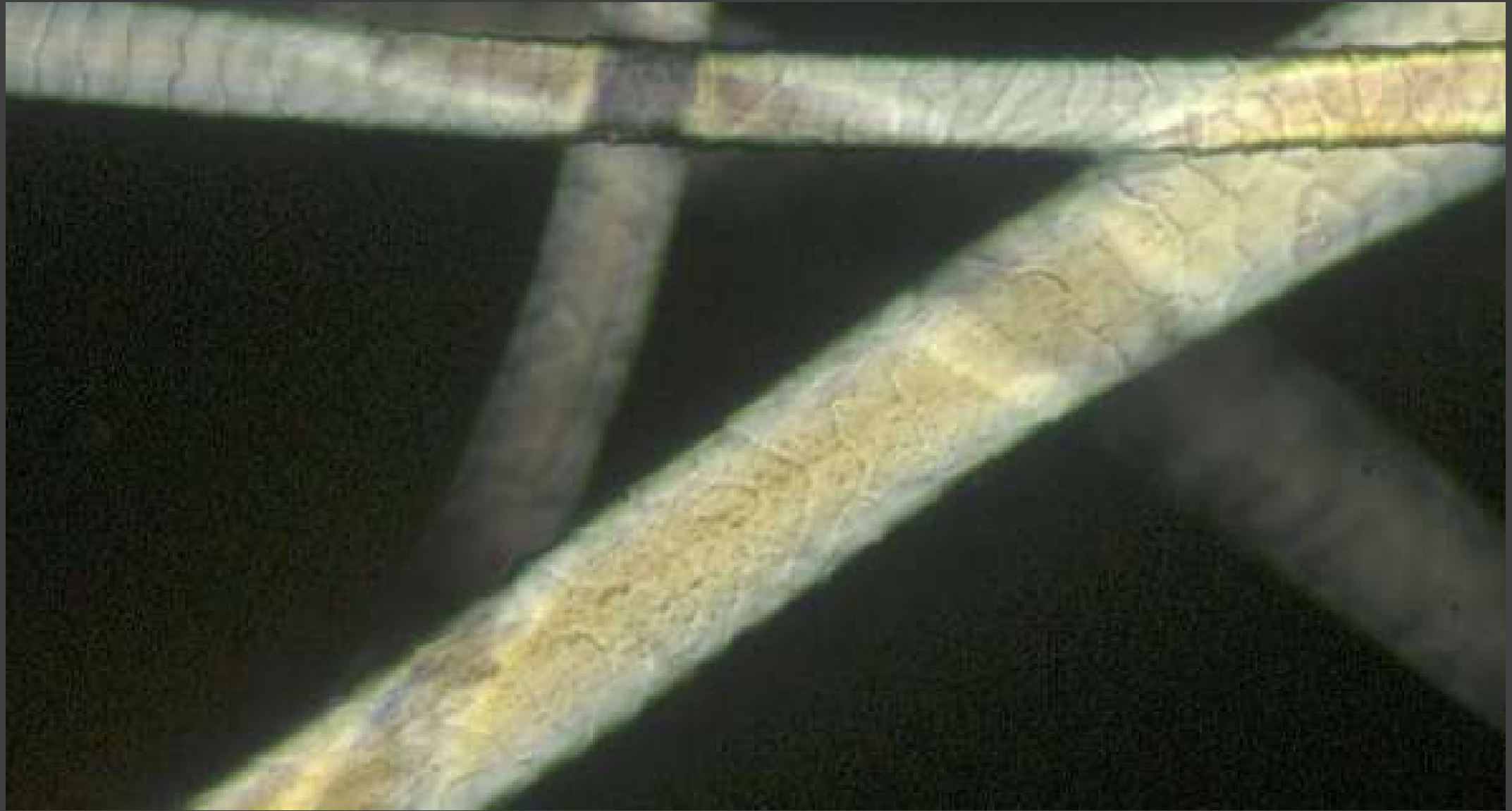


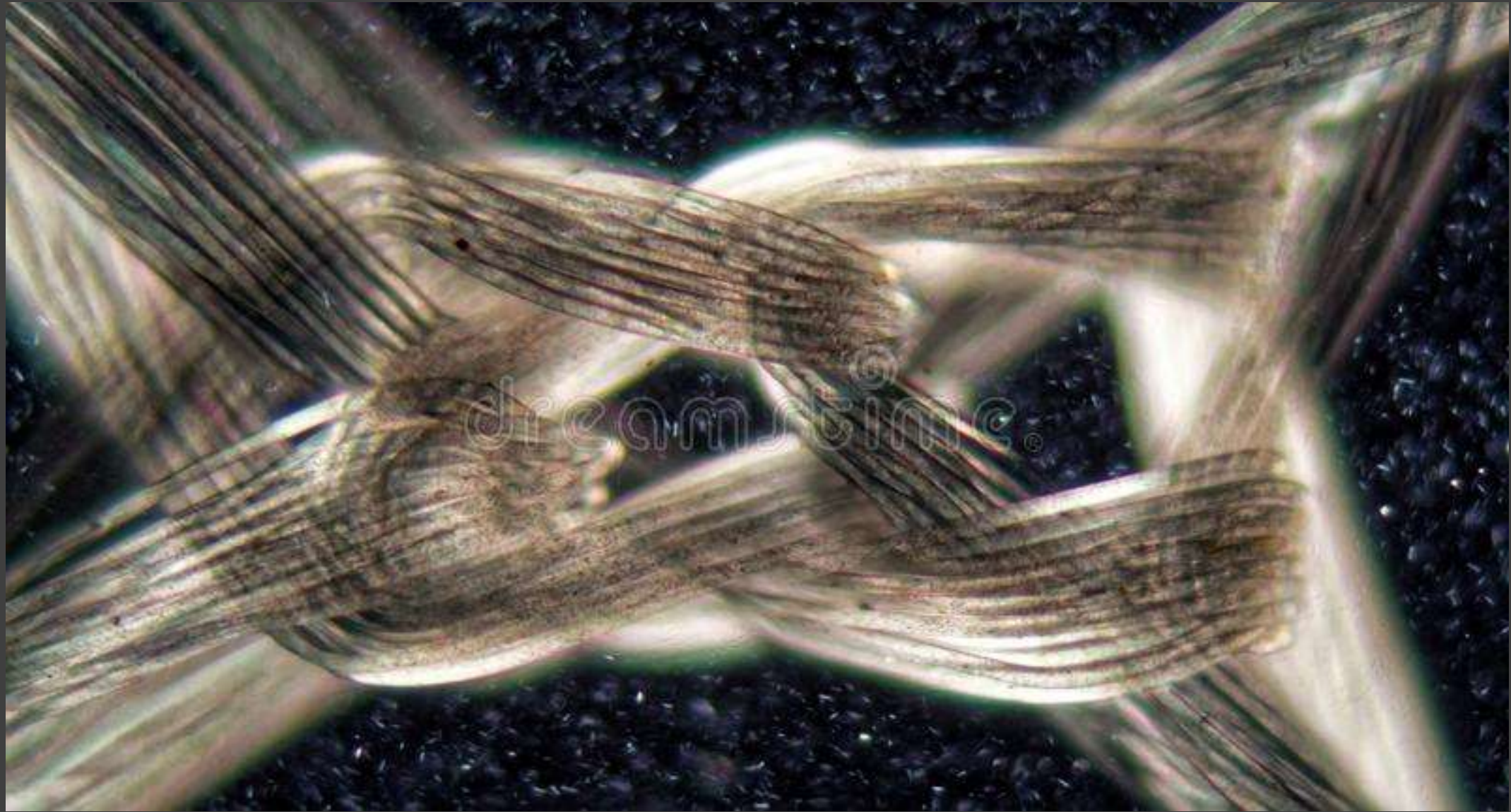


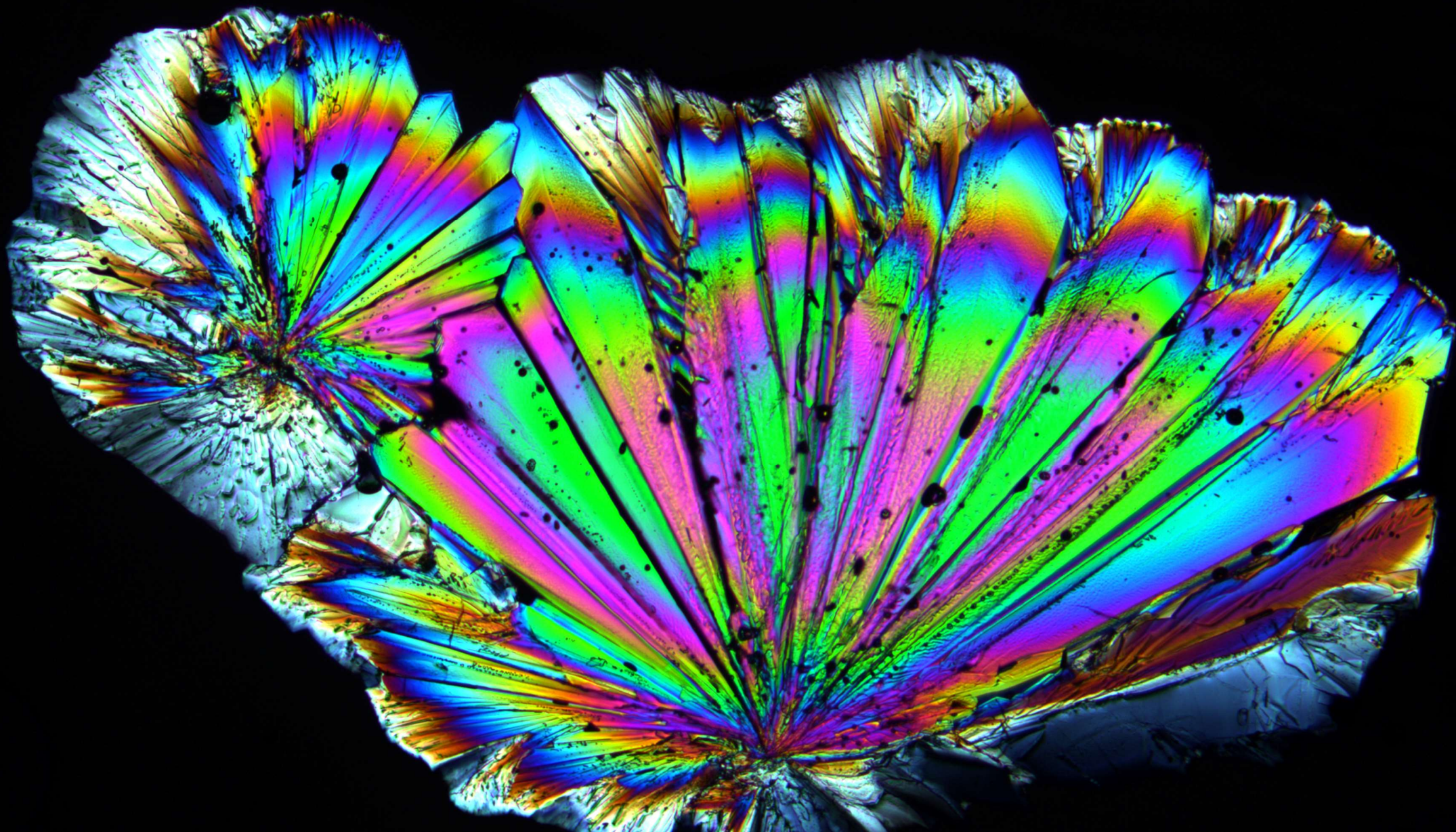


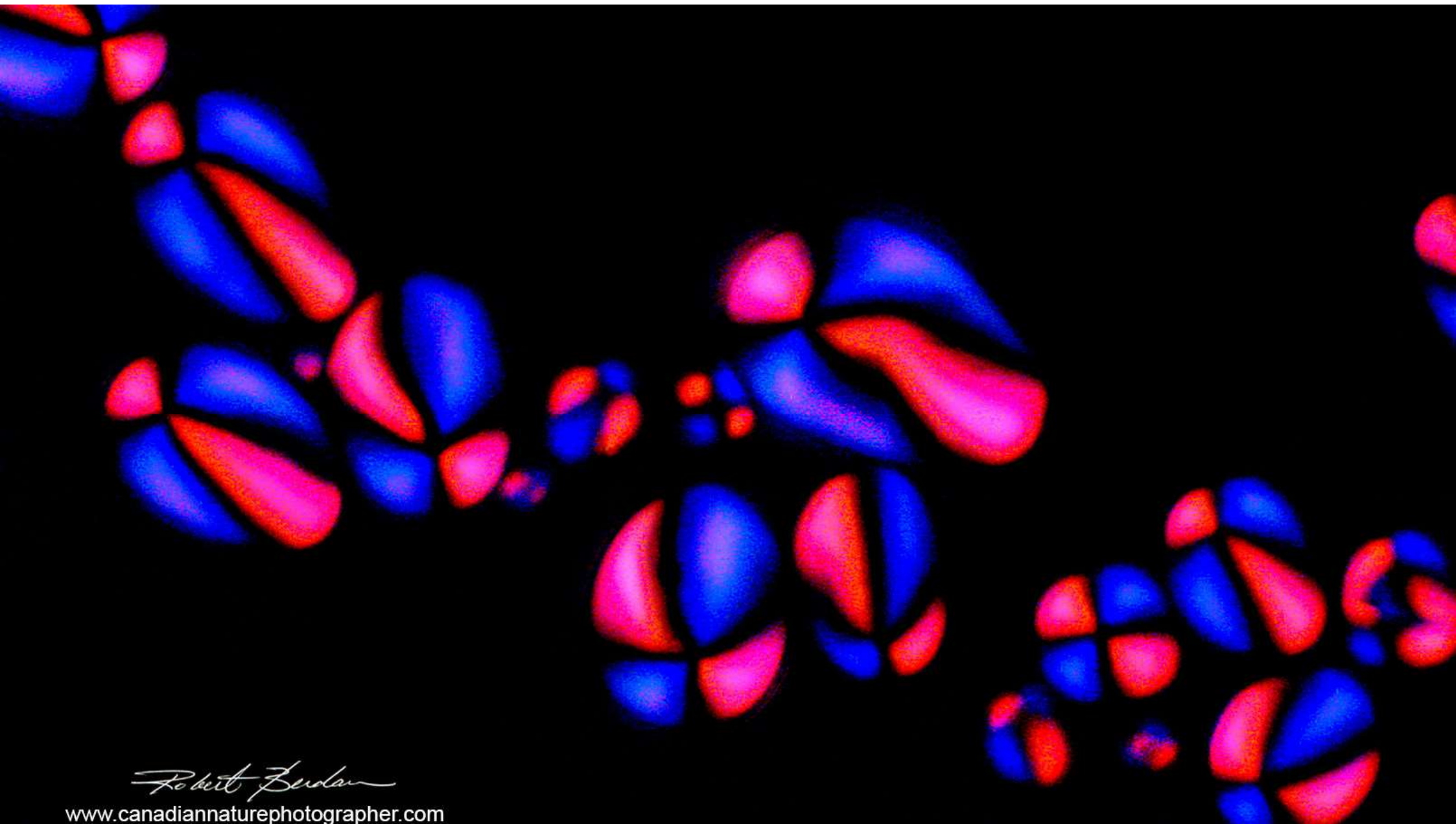












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