

# Fibras Ópticas

OpE - MIB 2007/2008

**Fibras Ópticas: Estruturas e Teoria de Propagação**

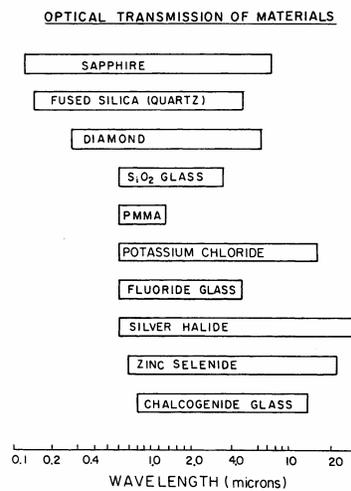
**Fibras Ópticas: Materiais e Técnicas de Fabrico**  
**Cabos de Fibra**

□ **Matérias-primas para o fabrico de fibras ópticas**

Na selecção de materiais para fabricar fibras certos requisitos devem ser satisfeitos:

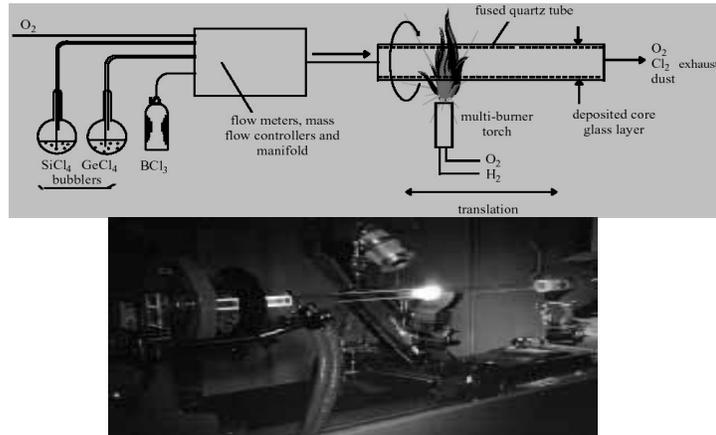
- Deve ser possível produzir fibras de espessura reduzida, flexíveis e com grandes comprimentos
- O material deve ser transparente no comprimento de onda de operação
- Devem existir materiais compatíveis com índices de refração ligeiramente diferentes para o núcleo e a bainha

- Materiais usados para o fabrico de fibras ópticas



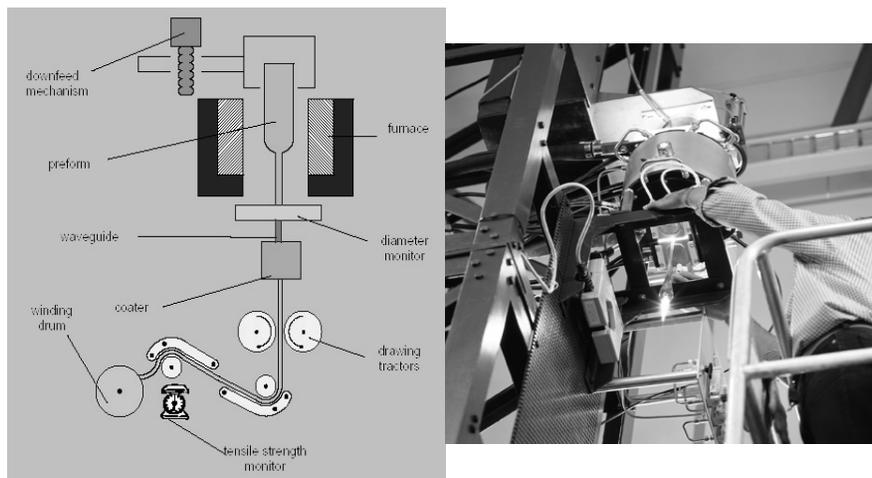
□ Preforma

- Fabricação da preforma



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FibOpt 66

- Estiramento da preforma

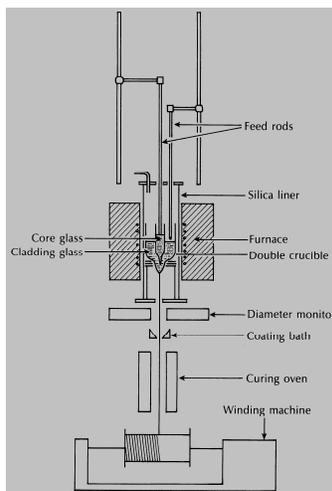


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FibOpt 67

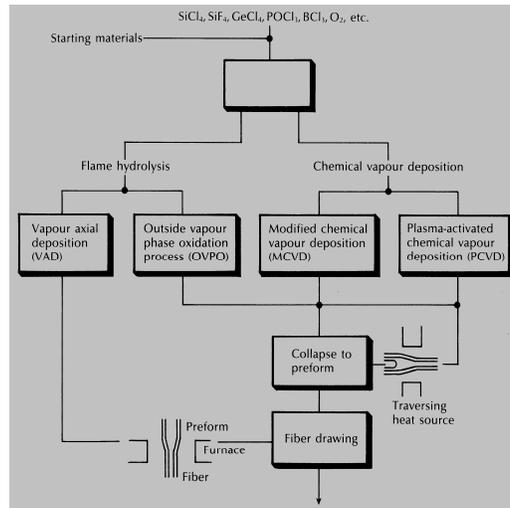
□ Técnicas de fabrico

- Técnica "direct-melting"
- Técnica "vapour-phase deposition"

- Método "double-crucible"



- Métodos "vapour-phase deposition"



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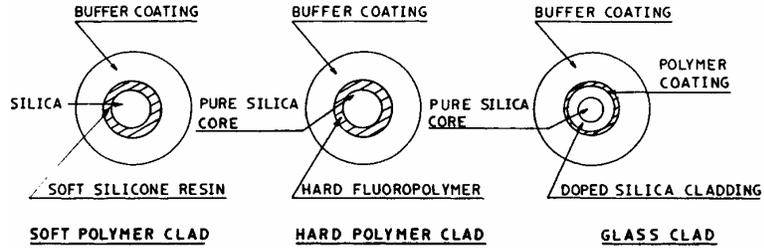
□ Cabos de fibras ópticas

As funções do cabo de fibras ópticas são:

- Protecção da fibra
- Estabilidade das características de transmissão das fibras
- Resistência mecânica
- Identificação e junção das fibras no interior do cabo

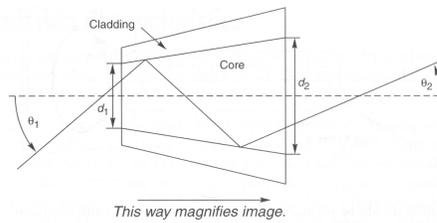
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FibOpt 71

- Protecções para fibras do tipo "fused silica":



□ Extremos e pontas das fibras modificadas

- "Tapers"

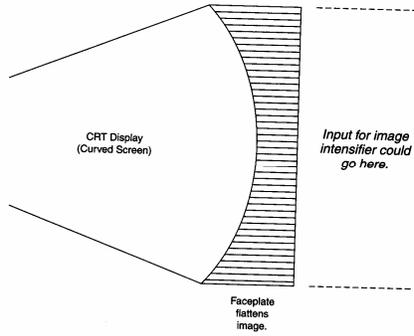


$$d_1 \cdot \text{sen} \theta_1 = d_2 \cdot \text{sen} \theta_2$$



□ Extremos e pontas das fibras modificadas

- "Faceplates"

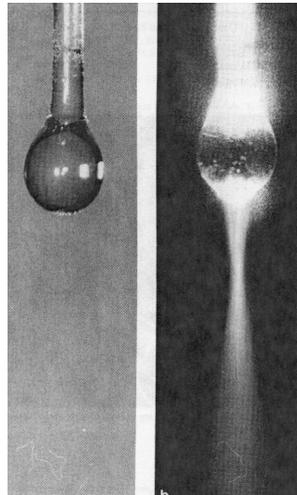
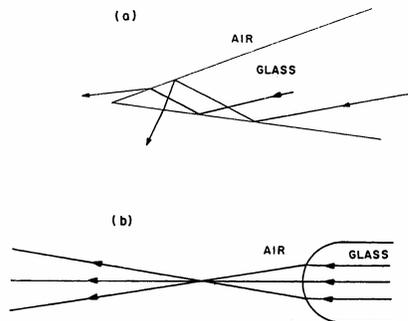


Faceplate Polishing

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□ Extremos e pontas das fibras modificadas

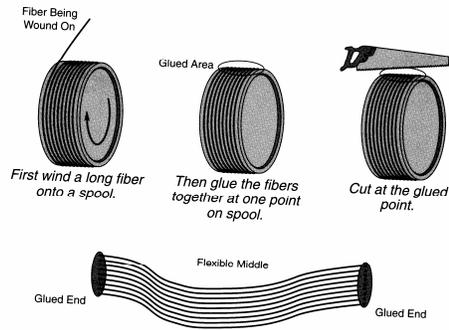
- "Tips"



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□ “Bundles” de fibras ópticas

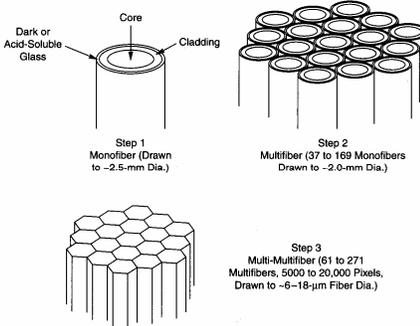
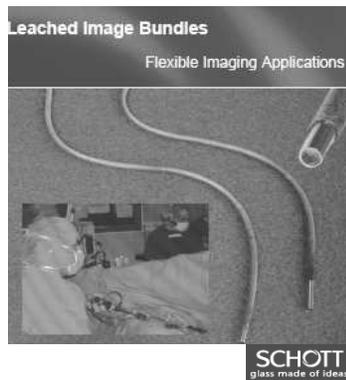
- Fabricação:
  - “Wound Fiber Bundles”



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FibOpt 76

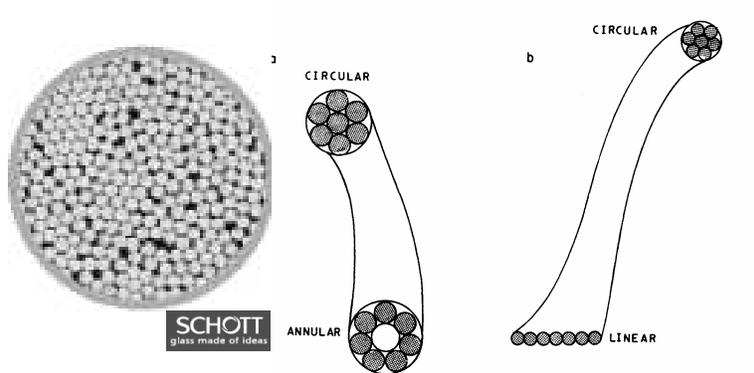
□ “Bundles” de fibras ópticas

- Fabricação:
  - “Leached Fiber Bundles”



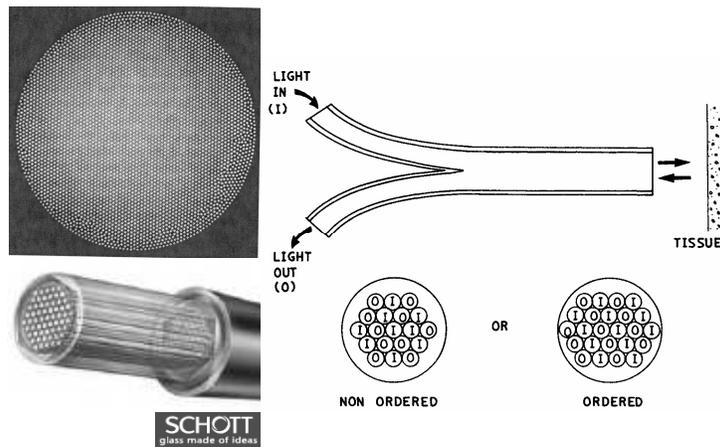
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- “Bundles” de fibras ópticas
  - “Nonordered Fiberoptic Bundles”



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FibOpt 78

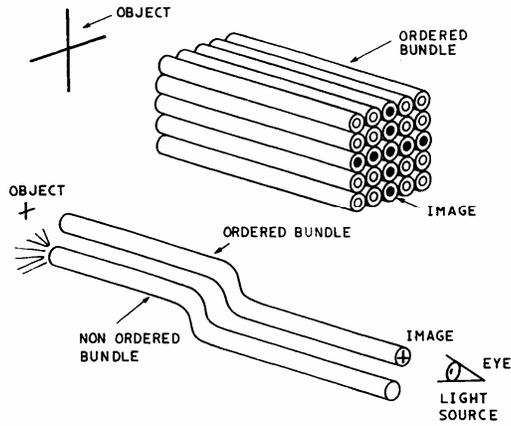
- “Bundles” de fibras ópticas
  - “Ordered Fiberoptic Bundles”



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FibOpt 79

□ “Bundles” de fibras ópticas

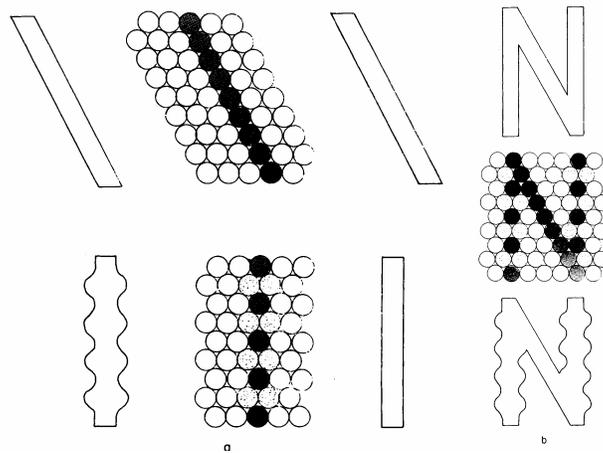
- “Ordered Fiberoptic Bundles”: transmissão de imagens



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FibOpt 80

□ “Bundles” de fibras ópticas

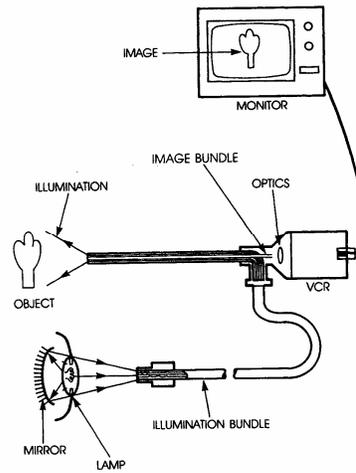
- “Ordered Fiberoptic Bundles”: transmissão de imagens



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FibOpt 81

□ “Bundles” de fibras ópticas

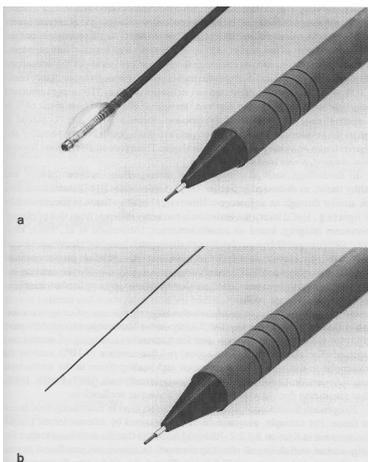
- “Fiberscopes”



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FibOpt 82

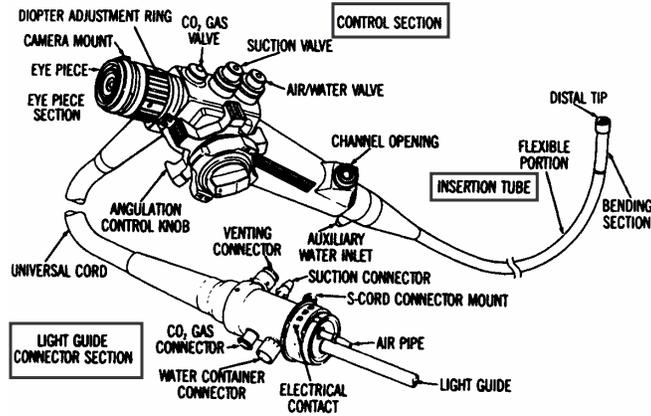
□ “Bundles” de fibras ópticas

- “Fiberscopes: Thin and Ultrathin”



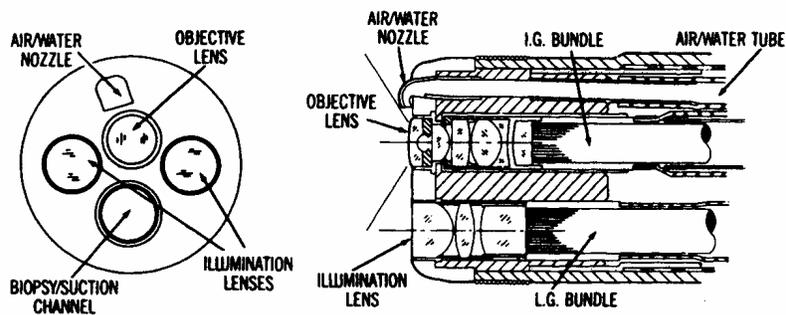
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FibOpt 83

- Endoscopia
  - O endoscópio



OpE 0708  
FibOpt 84

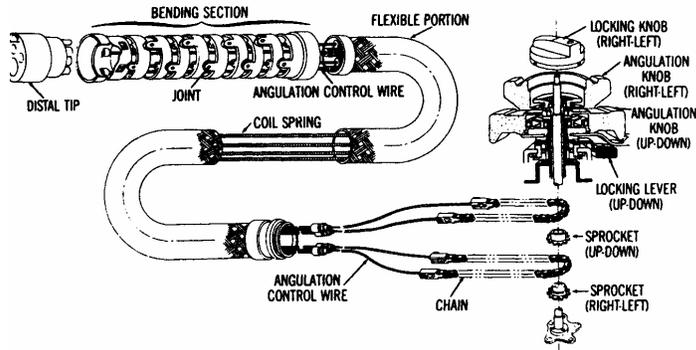
- Endoscópio
  - O extremo distal



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FibOpt 85

□ Endoscópio

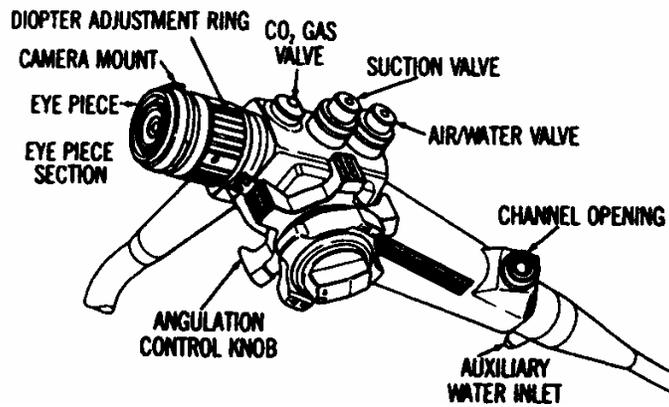
- O tubo flexível: mecanismo angular



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FibOpt 86

□ Endoscópio

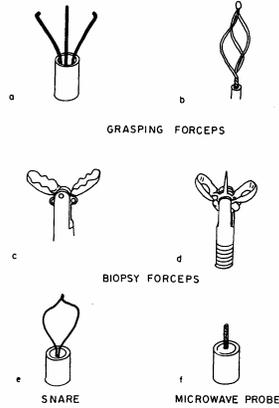
- O extremo proximal



OpE 0708  
FibOpt 87

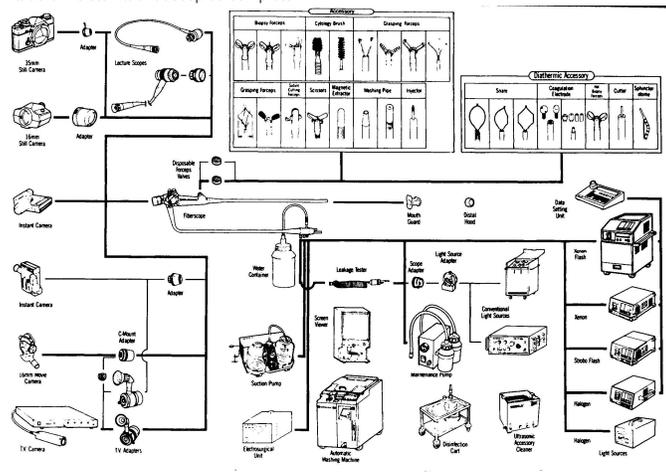
□ Endoscópio

- Dispositivos auxiliares mecânicos



□ Endoscópio

- Esquema de um sistema endoscópico completo



□ Endoscópio

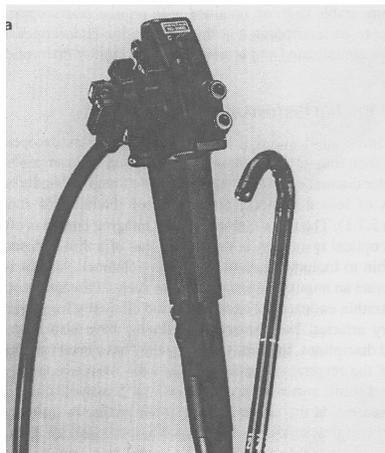
- Parâmetros característicos



Link: [http://www.olympus-europa.com/endoscopy/OLY\\_146\\_07\\_Endoscope\\_overv\\_2007.pdf](http://www.olympus-europa.com/endoscopy/OLY_146_07_Endoscope_overv_2007.pdf)

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FibOpt 90

□ Vídeoadoscópio



OpE 0708  
FibOpt 91

□ Diagnóstico por endoscopia

- Endoscopia por fluorescência  link: <http://www.youtube.com/watch?v=8hbv-eizoc>
- "Staining"
- Ampliação
- Imagens 3D e determinação de tamanhos

□ Terapia por endoscopia

- Cirurgia
- Electro-cirurgia e coagulação
- Corte e coagulação por micro-ondas
- "Grasping"
- Biópsias

