INAF

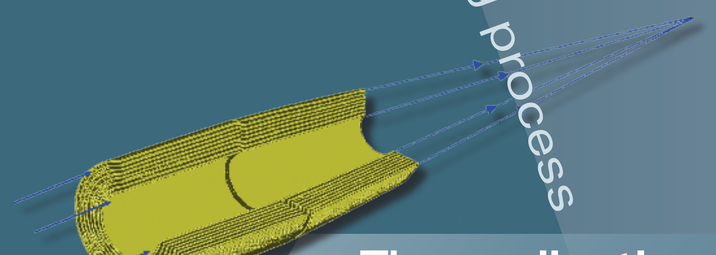
ISTITUTO NAZIONALE DI ASTROFISICA
NATIONAL INSTITUTE FOR ASTROPHYSICS

Ultralight optics from the more advanced telescopes to the industrial applications

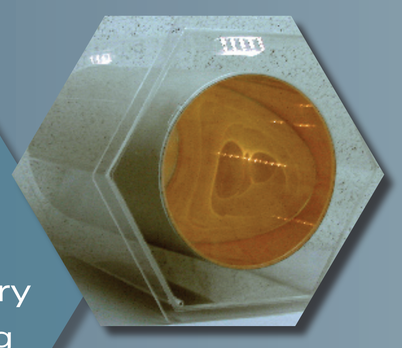
Space Astrophysics requires the development of robust, light and precise optics

Replication technology using the electroforming process

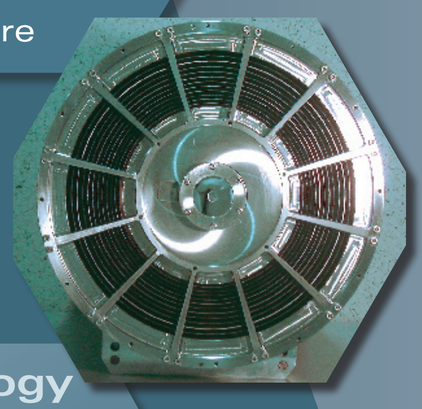
Silicon carbide for high performing optics



The replication technology using the electroforming process has been conceived to realize optics for x-rays



In High Energy Astrophysics it's necessary to use mirrors that collect x-rays working at grazing incidence.
The surfaces obtained from the electrodeposition process have a perfect profile, with a microroughness less than 0.5 nanometre



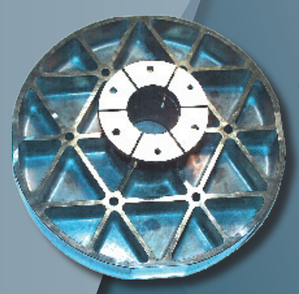
This technology has been applied to various wavelengths and in fields that are very different one another

- Space missions Beppo-Sax (ASI), XMM-Newton (ESA) and Swift (NASA);
- Optics for terminals of "point-to-point" optical telecommunication systems;
- Panels for the radiotelescope reflectors of the ALMA project

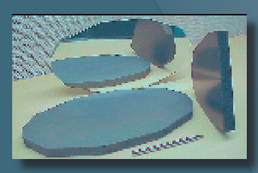
Due to the unique thermo-mechanical characteristics, SiC permits to realize high performing and light mirrors

As it's slightly deforming in presence of lapse rate, SiC in structural elements permits to realize intrinsically stable optic systems, like the cryogenic mirrors, that work at 30 °K

Thanks to a large scale experimentation, researchers succeeded in optimizing processes for the use of SiC:



- Highly polishable SiC skins deposited on suitable substrates;
- Densification of the SiC surfaces to obtain polished surfaces with very low microroughness (</= 0.2nm RMS);
- Junctions of SiC unfinished products for complex and considerably big forms;
- Characterization of SiC products till -253 °C



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