Mirrors for improved FUV Astrophysics Observations

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Who are we?

GOLD develops novel coatings -mirrors, filters and polarizers- mainly for the EUV 40-100 nm and FUV 100-200 nm

Motivation

- FUV range is of great interest for astrophysics, solar physics and atmosphere physics communities
- More efficient and stable FUV mirrors will enable future improved space observatories

Targets

- Enhanced FUV durable reflectance mirrors based on Al/MgF_2 and Al/AlF_3
- Narrowband FUV mirrors tuned at the desired wavelength
- Narrowband mirrors with high reflectance at Ly- β (102.6 nm) and high rejection at Ly- α (121.6 nm)

Our Equipment

Main deposition chamber

- ISO-6 Clean room
- Fulfills space requirements
- Thermal evaporation
- Ion-Beam Sputtering

EUV-FUV Reflectometer

- Grazing Incidence Monochromator
- 40-200 nm covered
- In-situ measurements is possible

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Conclusions

GOLD has developed FUV high performance coatings:

- 1) Broadband FUV mirrors
- 2) Narrowband FUV mirrors peaked at $\lambda > 120$ nm
- 3) Narrowband Ly- β reflector with high rejection at Ly- α
- 4) We can develop mirrors, transmittance filters, polarizers,..., to satisfy **your challenges**

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SPIE- Astronomical Telescopes- December 2020

High reflectance FUV Al mirrors protected with **hot deposited:**

MgF_2

L. Rodríguez de Marcos et al. Optics Express 26, 9363 (2018)

- High reflectance Al/MgF_2 and Al/AlF_3 mirrors
- AlF_3 : competitive with MgF_2 to protect Al

Deposition method followed in the mirrors prepared at 250 °C:
M. Quijada et al. Proc. Of SPIE 8450 H (2012)

AlF_3

N. Gutiérrez Luna et al. Coatings 9, 428 (2019)

Enhanced Al reflectance for MgF_2 or AlF_3 film deposited at 200-250 °C

Increasing deposition, heating and cooling rates
➡ Higher reflectance

Narrowband FUV Mirror

Narrowband (MgF_2/LaF_3)_n MLs can be tuned at any $\lambda > 120$ nm

Enhanced reflectance for deposition temperature at 240 °C

Aged MLs reflect >90%

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Narrowband mirrors peaked at Ly- β (102.6 nm) and high rejection at Ly- α (121.6 nm)

High Ly- β /Ly- α reflectance ratio

L. Rodríguez De Marcos et al. Optics Express 26, 25166 (2018)

Multilayers based on: $Al/LiF/SiC/LiF$

High peak reflectance