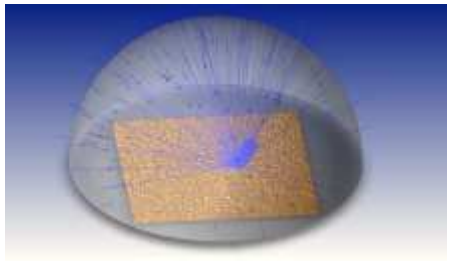
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

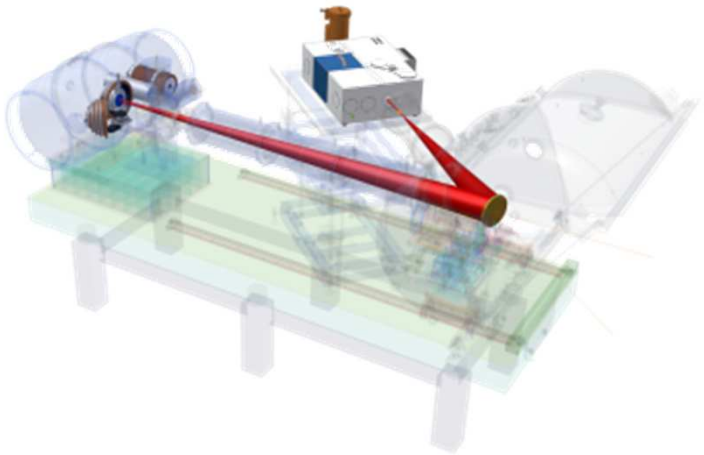
EMIRIM

Provision of preliminary reference samples



A. Adibekyan, E. Kononogova and C. Monte,

Working Group 7.32, Infrared Radiation Thermometry



Preliminary reference samples

Provision of appropriate reference samples

- PTB with support from all partners agreed on 5 types of preliminary reference samples (one specular reflective sample, one diffuse reflective sample, two samples with high emissivity and one sample with medium emissivity).
- PTB and LNE produced 11 sets of preliminary reference samples.
- The samples were characterized for spectral emissivity and homogeneity.
- The samples sets were provided to each partner

Preliminary reference samples

	Low emissivity: Infragold coatings	Specular sample: Ultra-Precision Technology	Medium emissivity: Laser-structured and gold plated, PTB workshop	High emissvity: Nextel, PTB workshop	High emissvity: Aremco Black coating, LNE
LNE	50*, 100*, 100	50, 100, 100	50, 100, 100	50, 100, 100	50, 100, 100
ZAE Bayern	40 x 60*, 50	40 x 60, 50	40 x 60, 50	40 x 60, 50	40 x 60, 50
DTU	50	50	50	50	50
FIW	100	100	100	100	100
IG	50	50	50	50	50
ACTIS	100	100	100	100	100
PTB	50, 100	50, 100	50, 100	50, 100	50, 100

* *50 mm in diameter, 100 mm in diameter, 40 x 60 mm rectangular*

Standard samples of 50 or 100 mm in diameter:

Special requirements:

ZAE Bayern

DTU

- *Production of 11 sets of preliminary reference samples*
- *Production of 66 samples of Al 6060 at PTB workshop*

Preliminary reference samples

	Low emissivity: Infra	Specular sample:	Medium emissivity:	High emissvity:	High emissvity: o Black coating, LNE
LNE	50				0, 100, 100
ZAE Bayern	4				40 x 60, 50
DTU					50
FIW					100
IG					50
ACTIS					100
PTB					50, 100

0 mm rectangular

Standard samples ents:

DTU

- *Production of 66 samples of Al 6060 at PTB workshop*

Preliminary reference samples

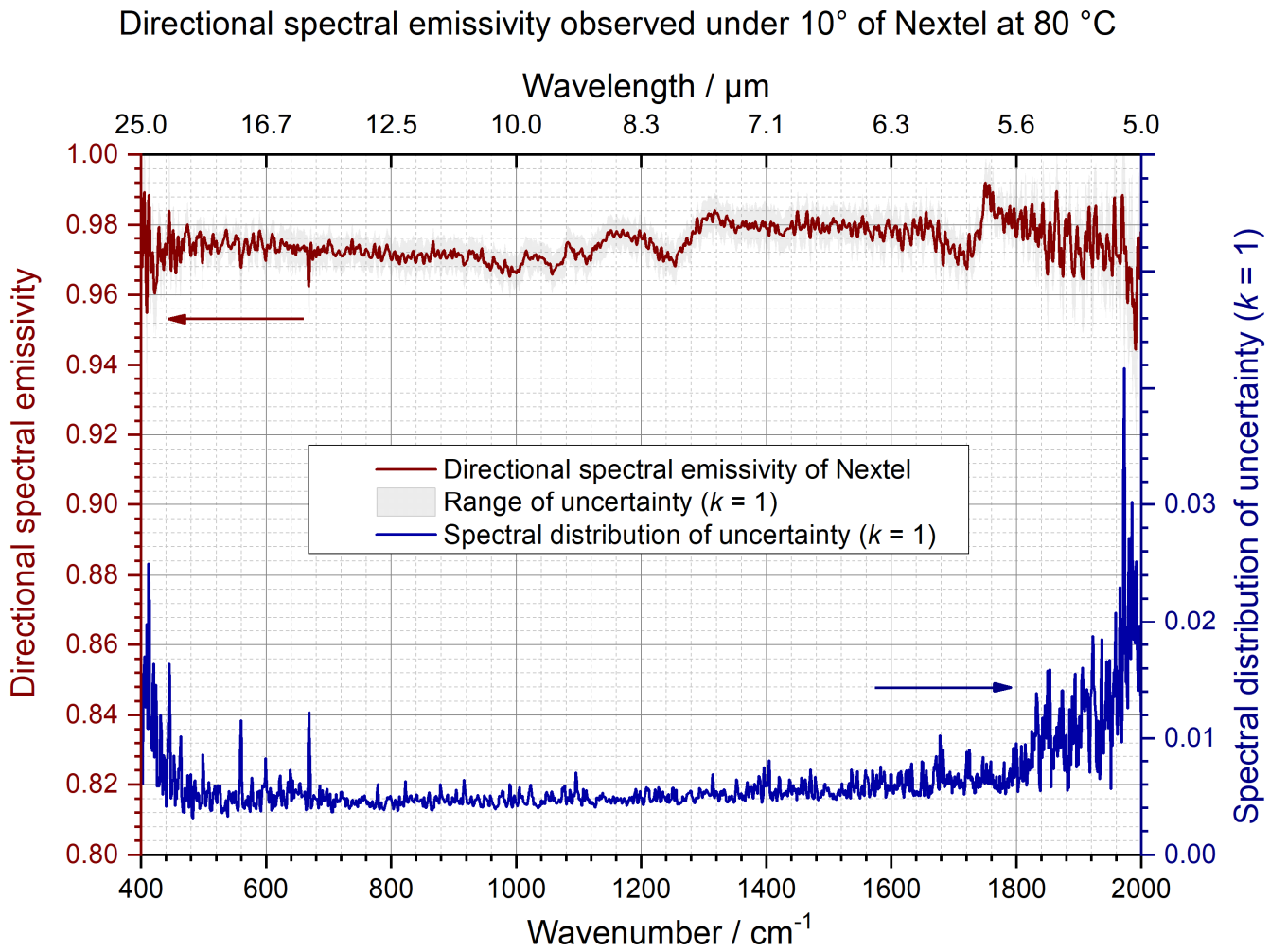
	Low emissivity: Infra	Specular sample:	Medium emissivity:	High emissvity:	High emissvity: o Black coating, LNE
LNE	50				0, 100, 100
ZAE Bayern	4				40 x 60, 50
DTU					50
FIW					100
IG					50
ACTIS					100
PTB					50, 100

0 mm rectangular

Standard samples ents:

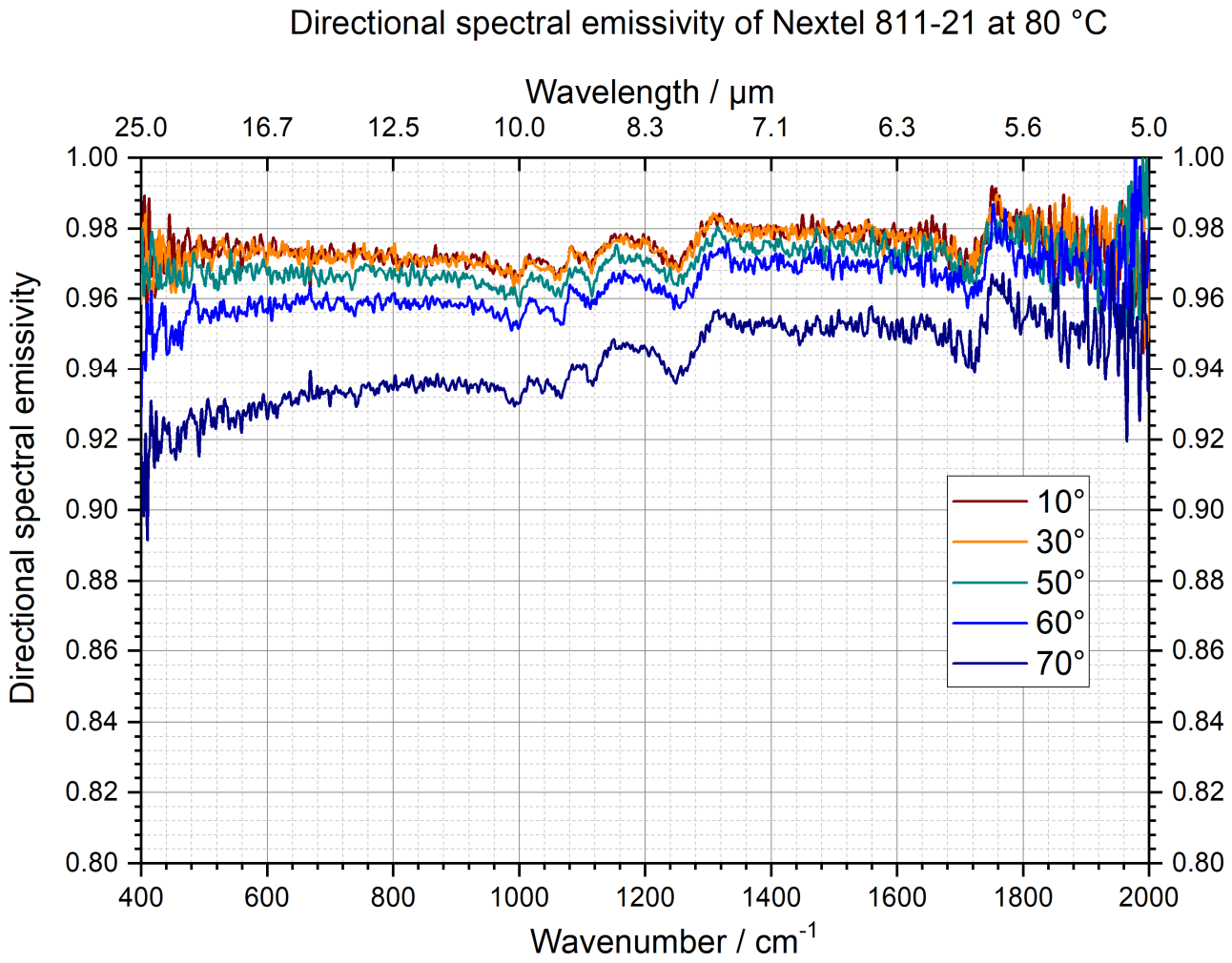
- *Production of 11 sets of preliminary reference samples*

High emissvity: Nextel



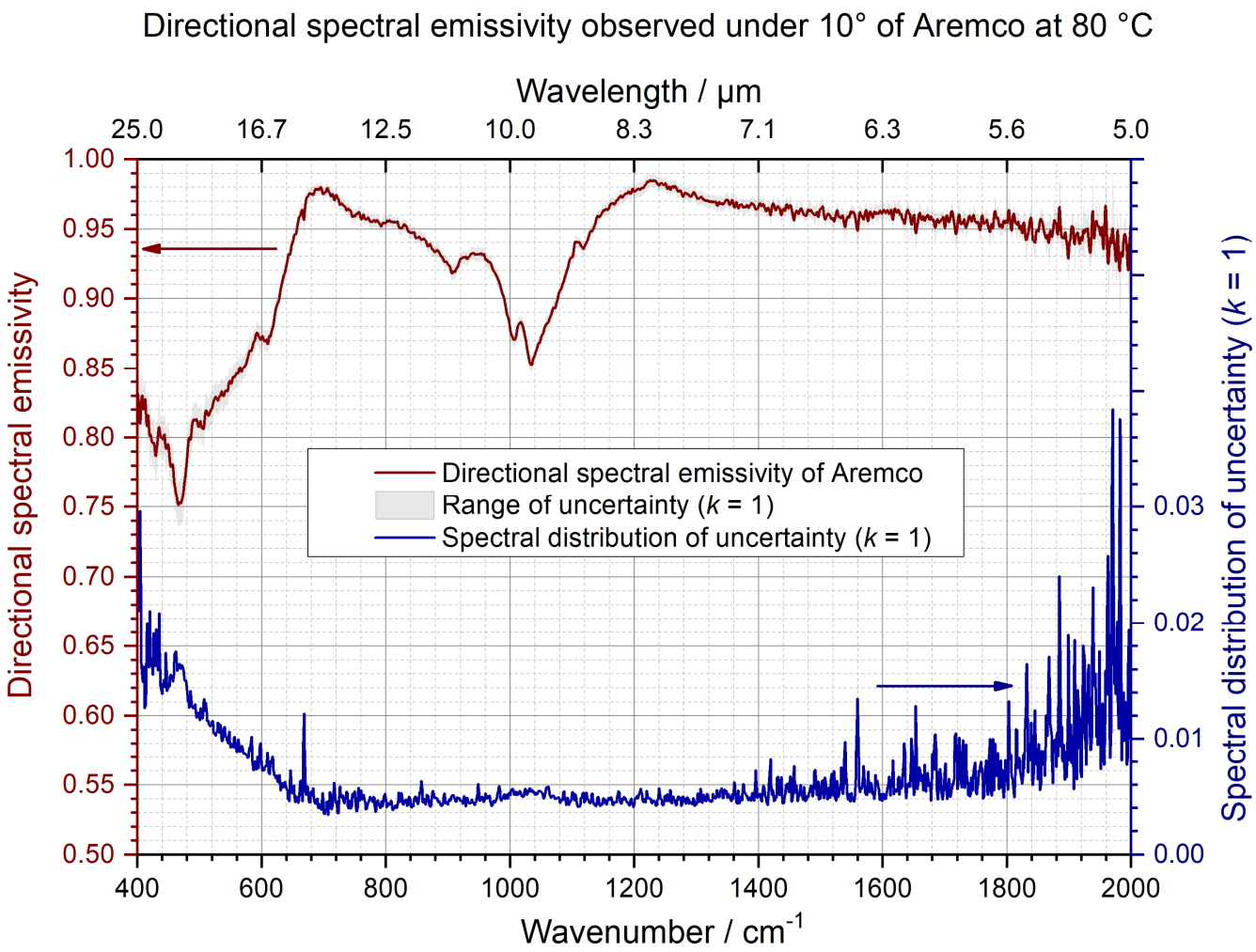
- *Stable and high emissivity of Nextel*

High emissvity: Nextel

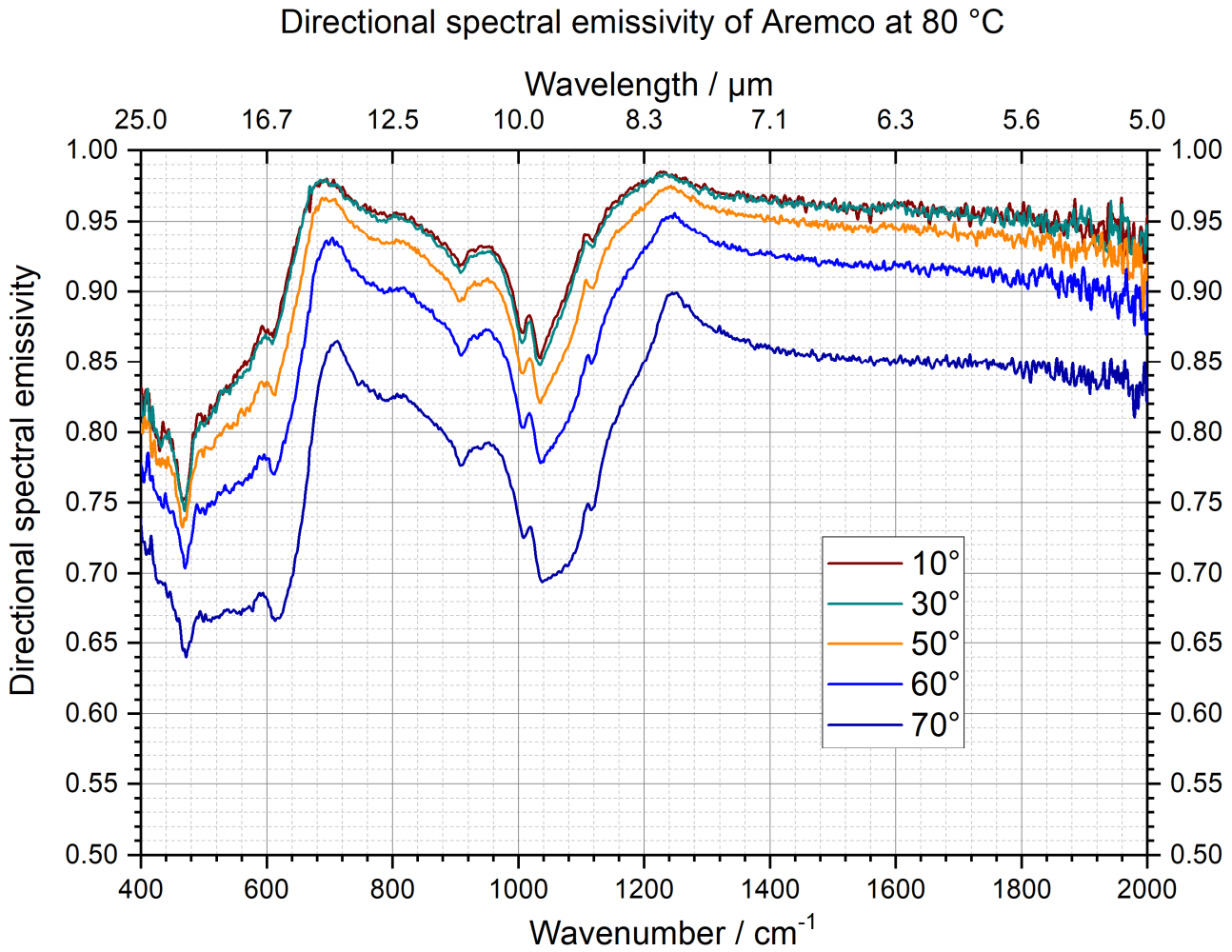


- *Stable and high emissivity of Nextel*

High emissvity: Aremco



High emissvity: Aremco



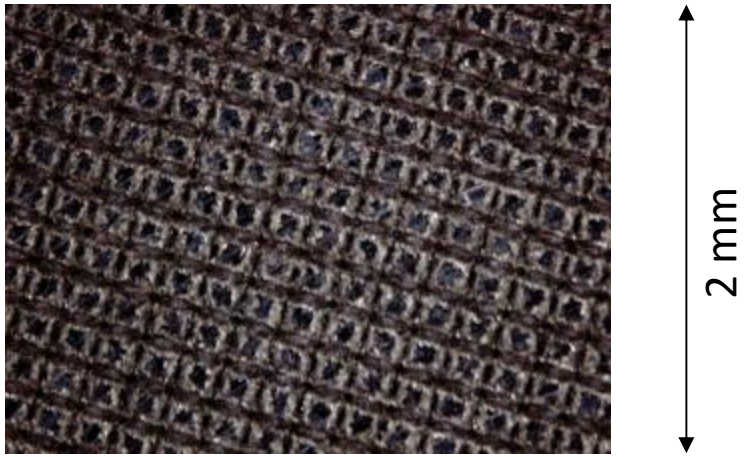
- *High emissivity and spectral structure*

Medium emissivity: laser-structured and gold plated

Sample of 100 mm in diameter of Al 6060

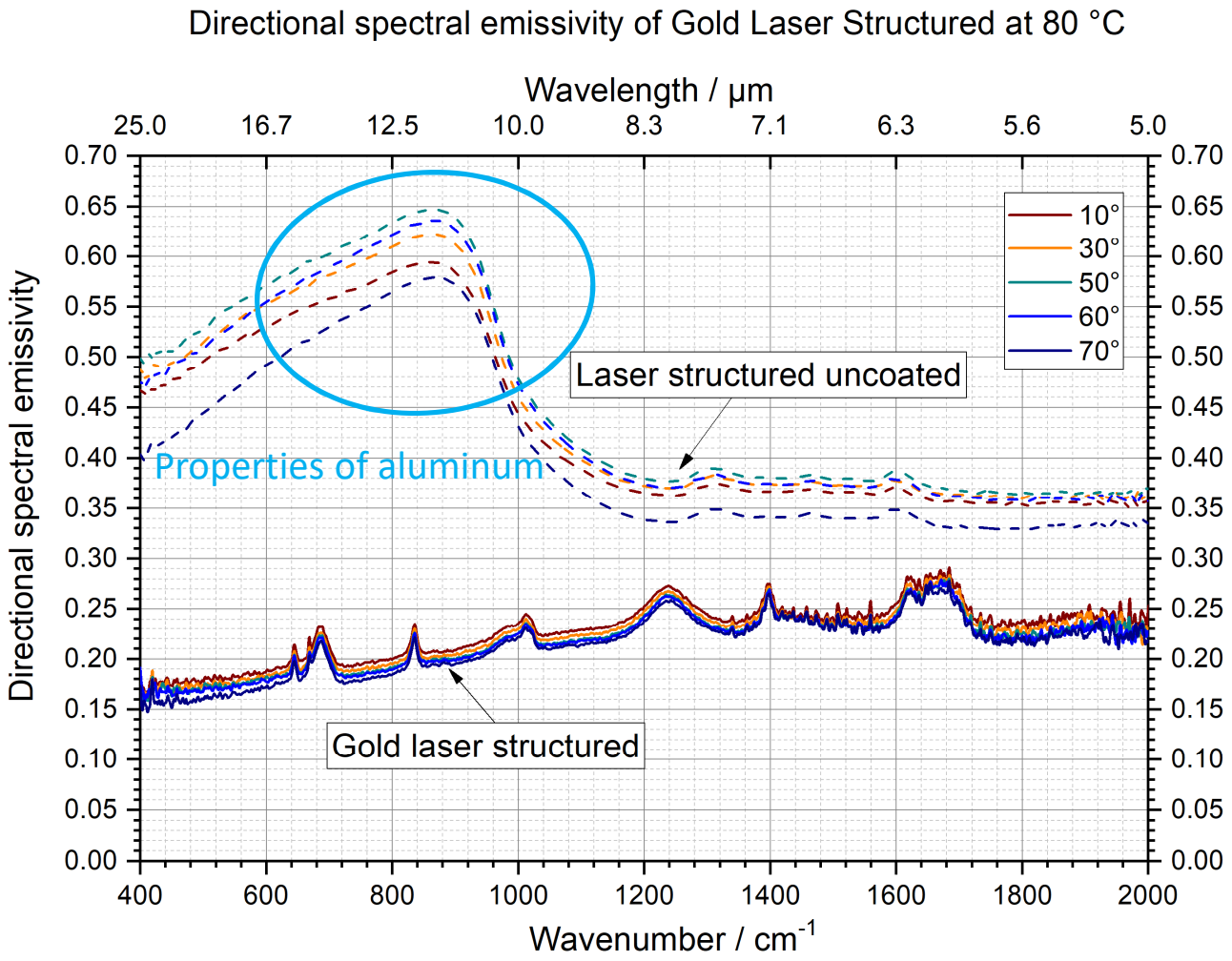
Sample was then covered with gold

Microscope image of sample



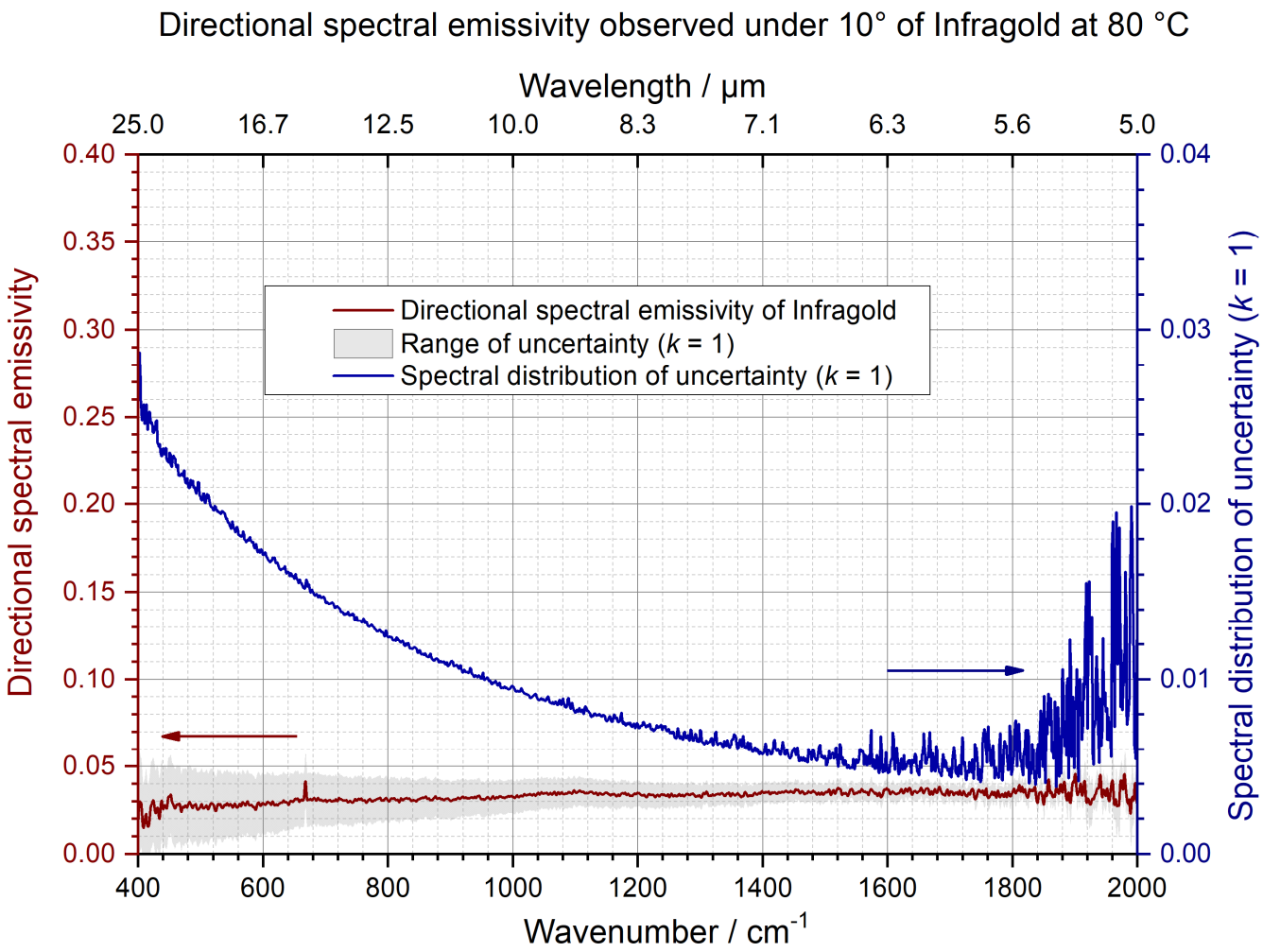
- *A special structure: grooves and pyramids with a deepening in the center*

Medium emissivity: laser-structured and gold plated

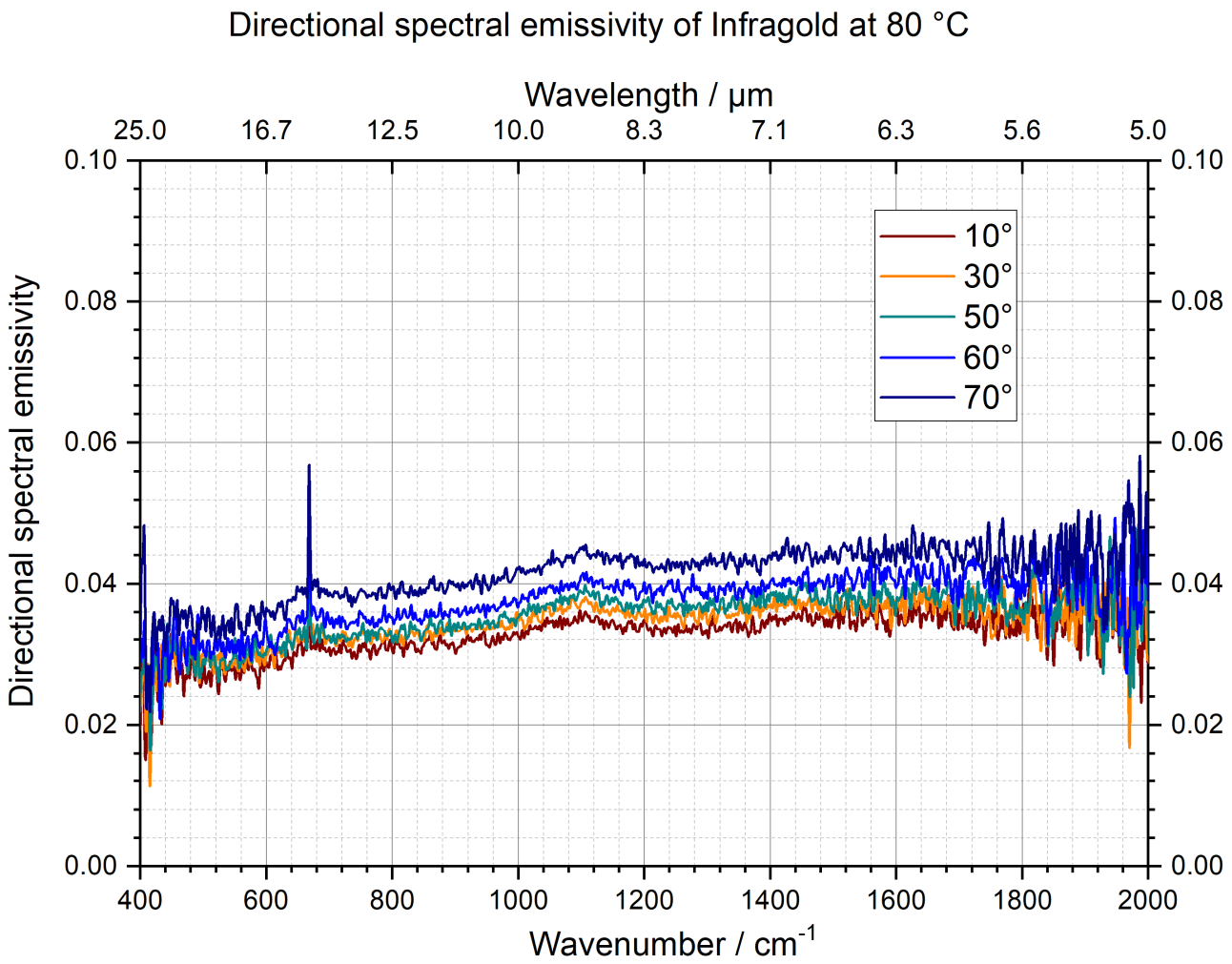


- *Small variation of angular distribution within the range of 0.03*

Low emissivity: Infragold coating

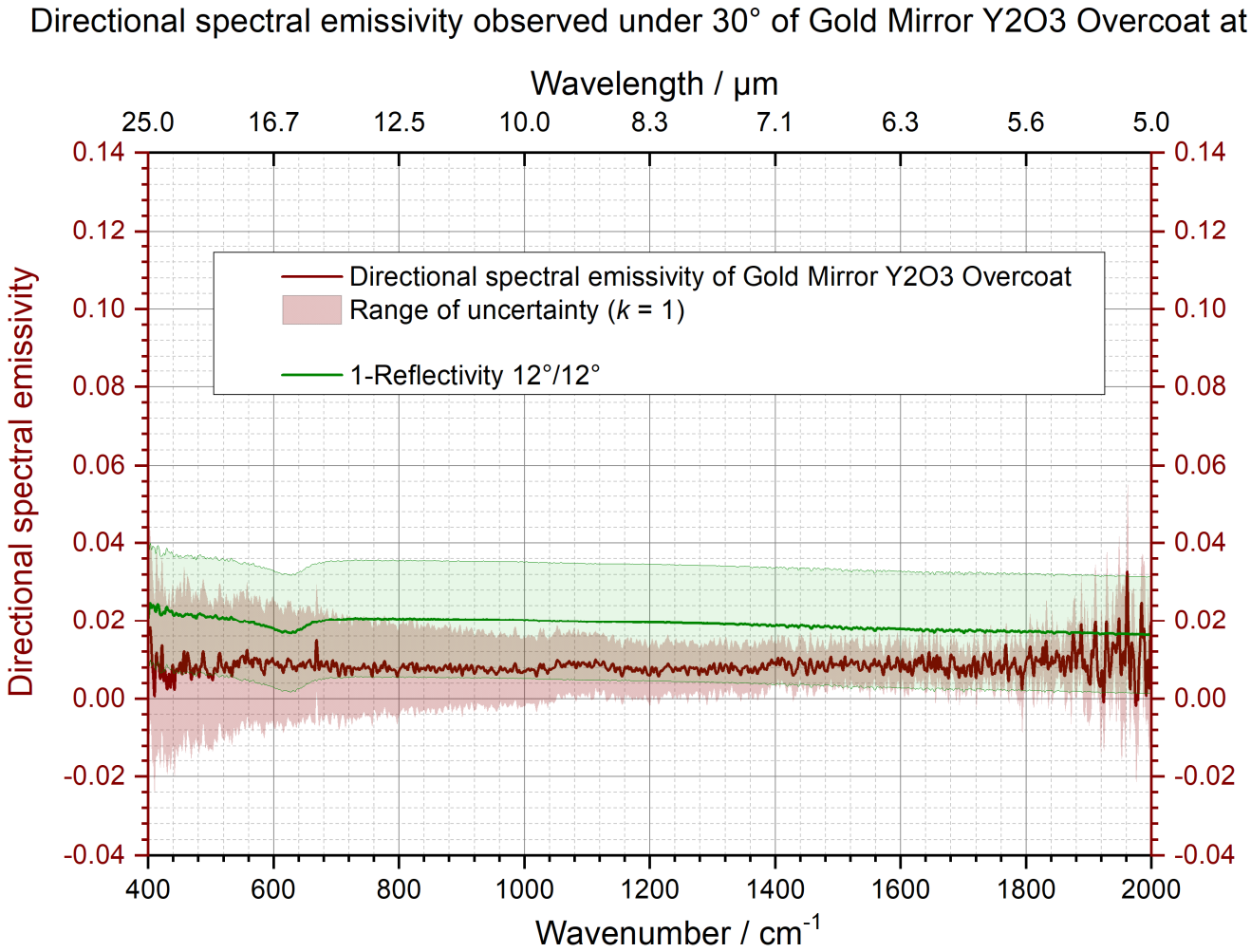


Low emissivity: Infragold coating



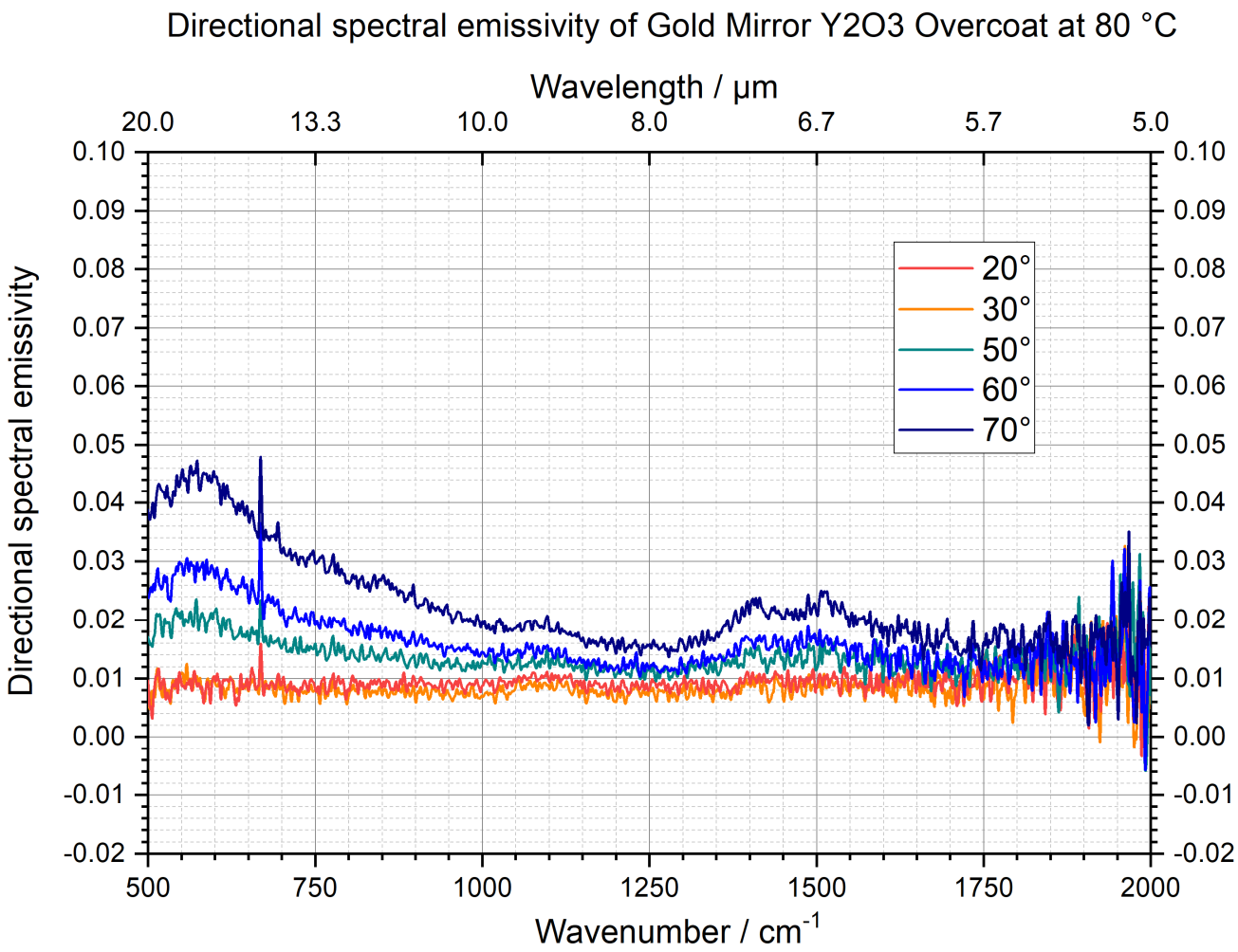
- *Small variation of angular distribution within the range of 0.02*

Specular sample: Gold Mirror Y2O3 Overcoat



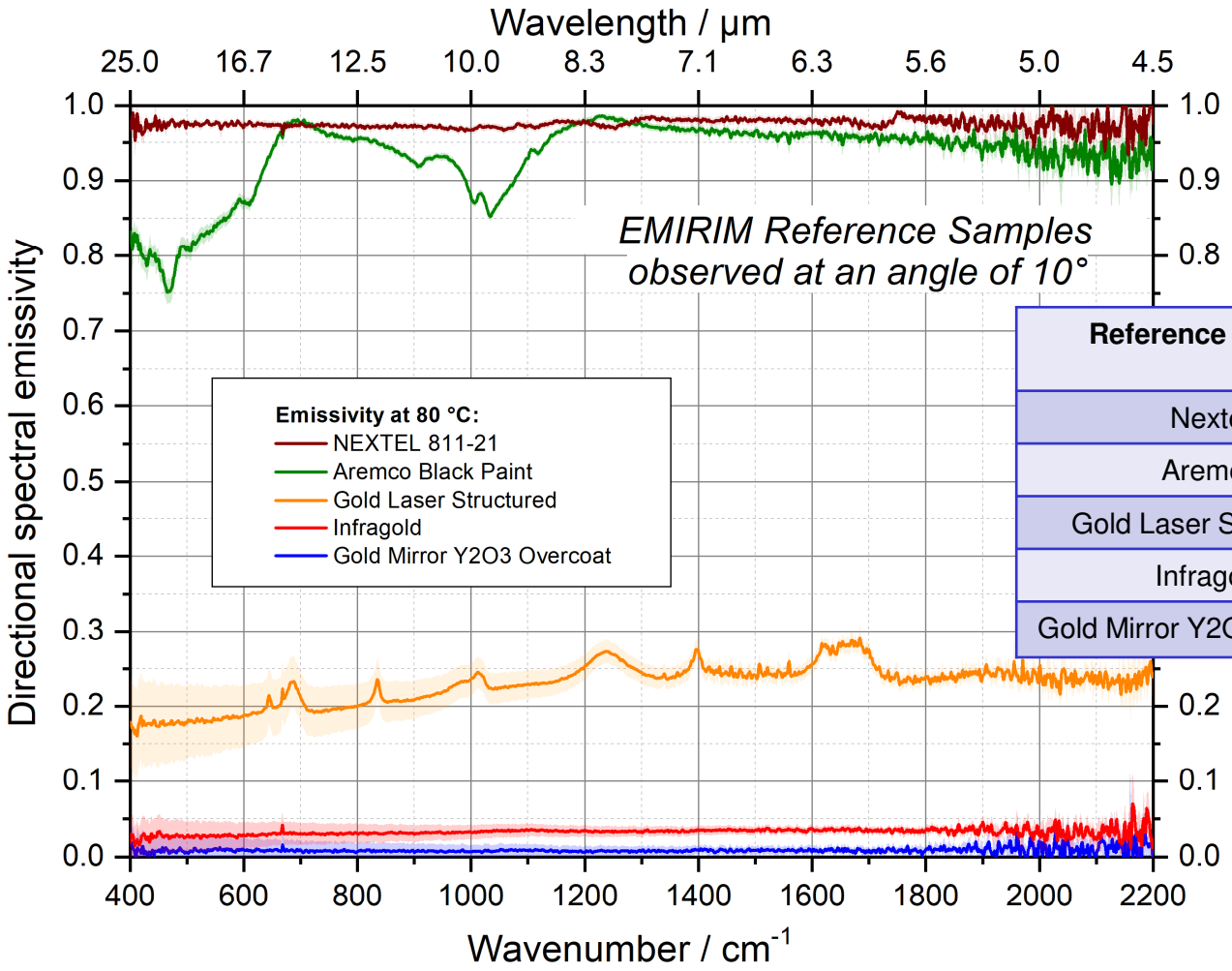
- *Specular reflectivity of 0.98*

Specular sample: Gold Mirror Y2O3 Overcoat



- *Specular reflectivity of 0.98*

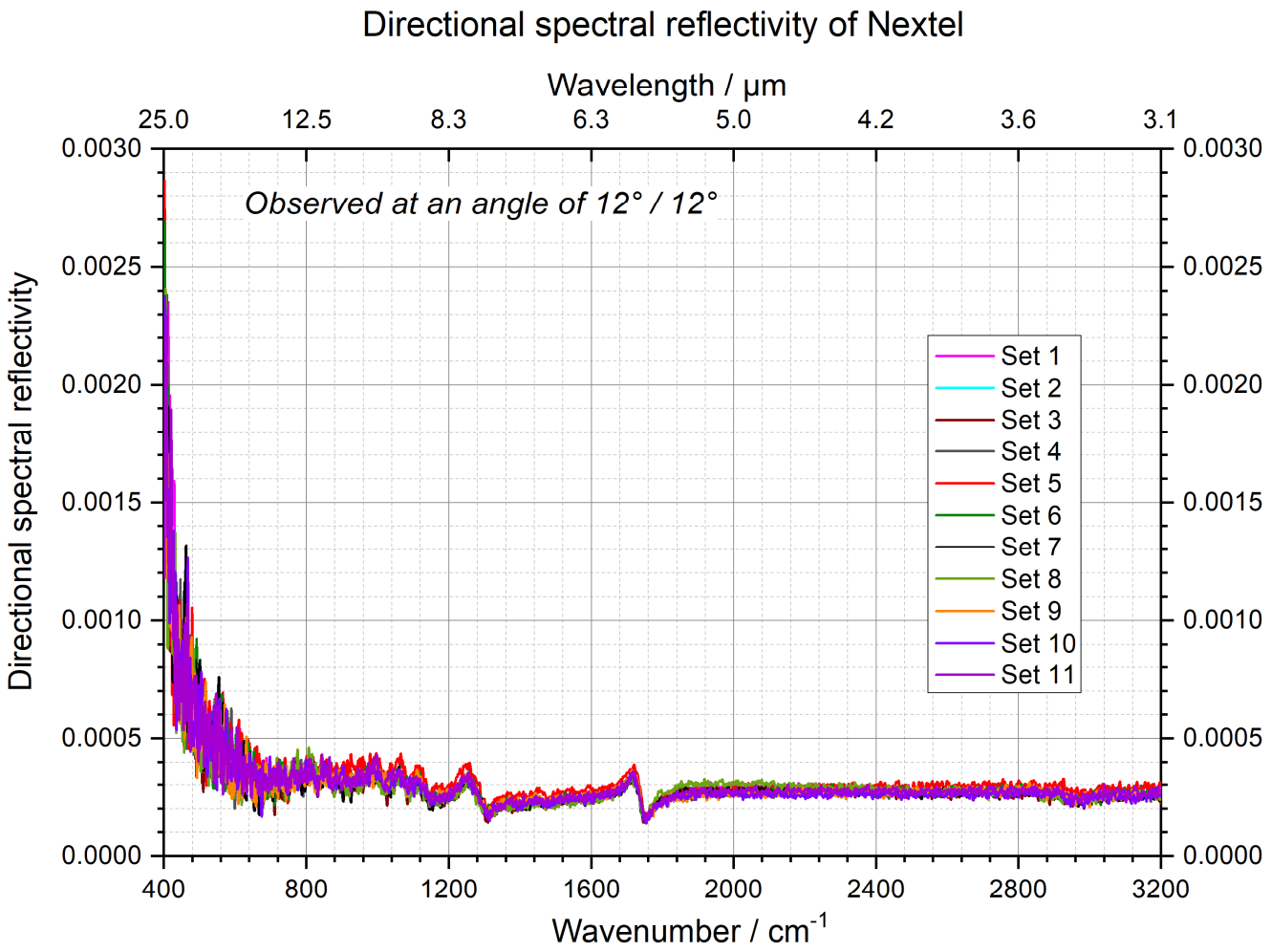
Emissivity of preliminary reference samples



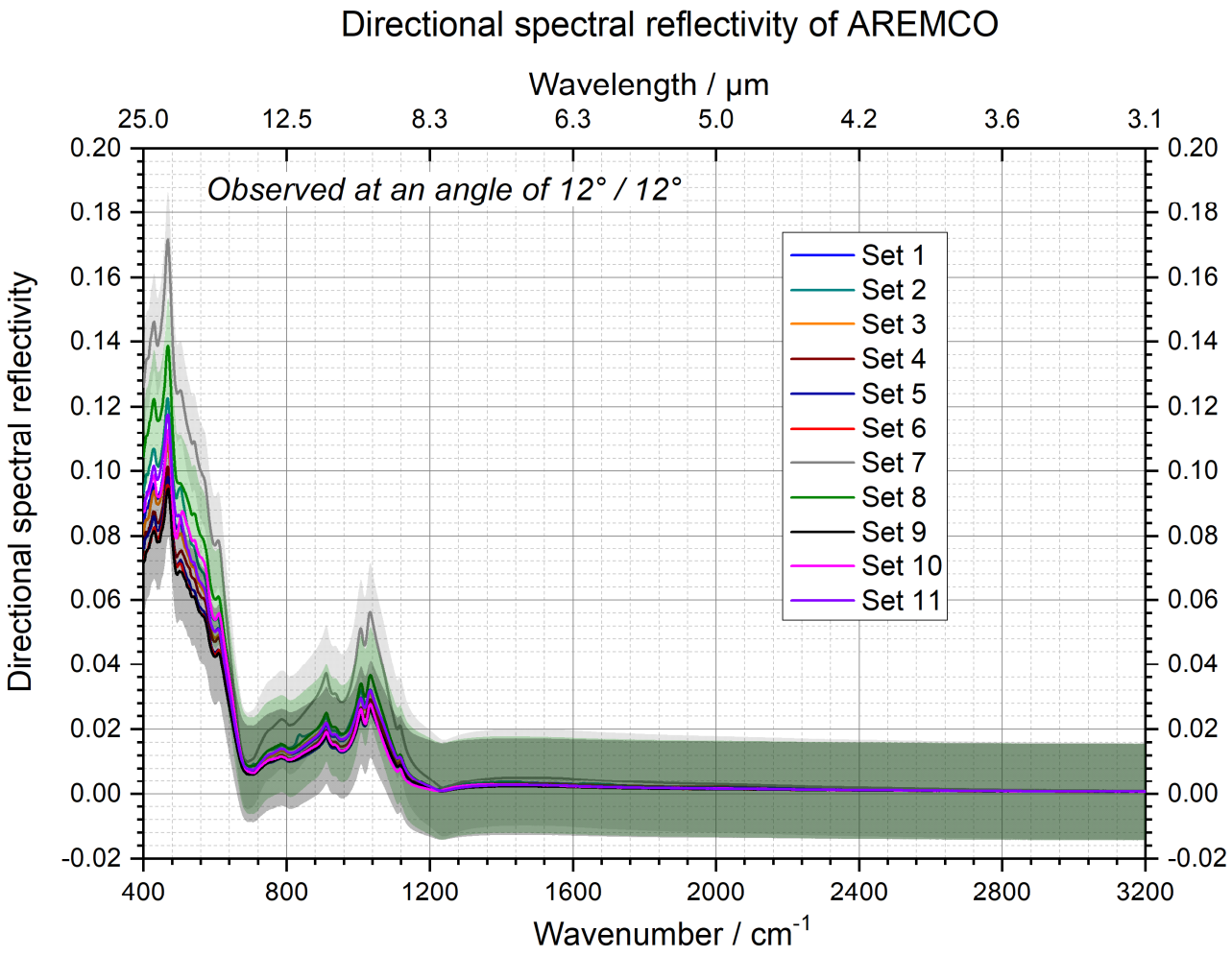
Reference sample	ε_{hem}	u(ε) (k=1)
Nextel	0.944	0.005
Aremco	0.878	0.007
Gold Laser Structured	0.211	0.025
Infragold	0.035	0.011
Gold Mirror Y2O3 Overcoat	0.017	0.010

- *PTB has calibrated emissivities of the preliminary reference samples*

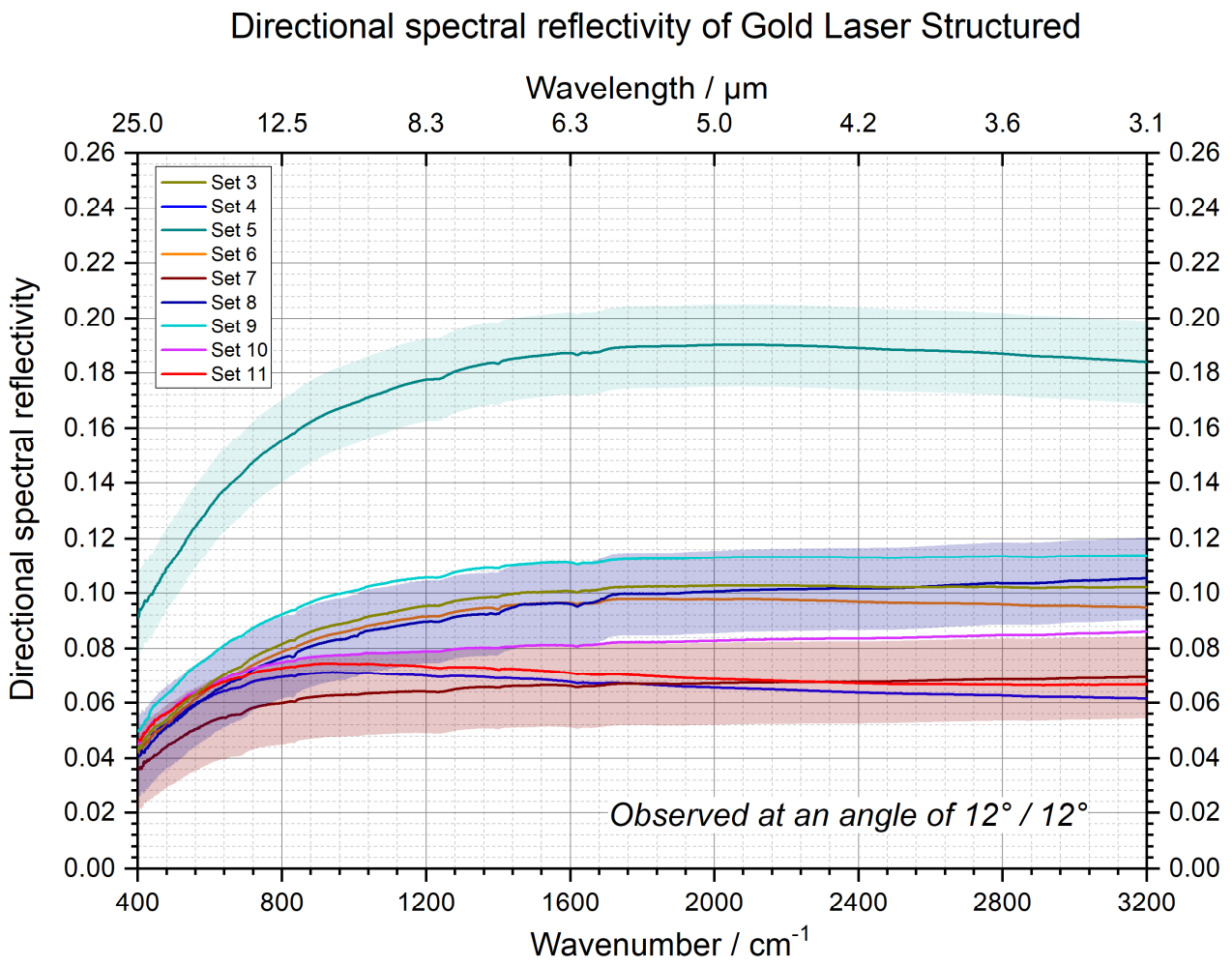
Variation among preliminary reference samples



Variation among preliminary reference samples

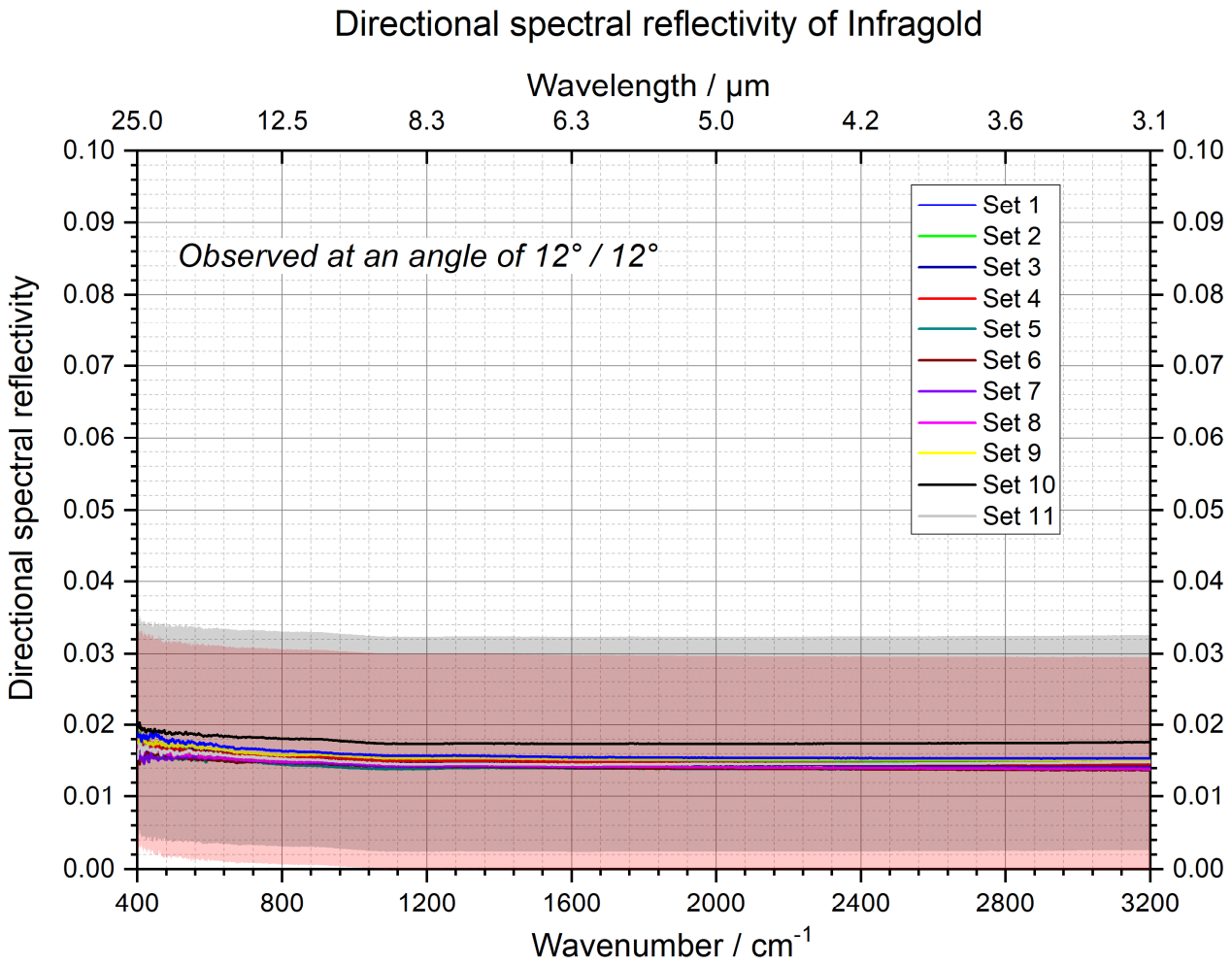


Variation among preliminary reference samples

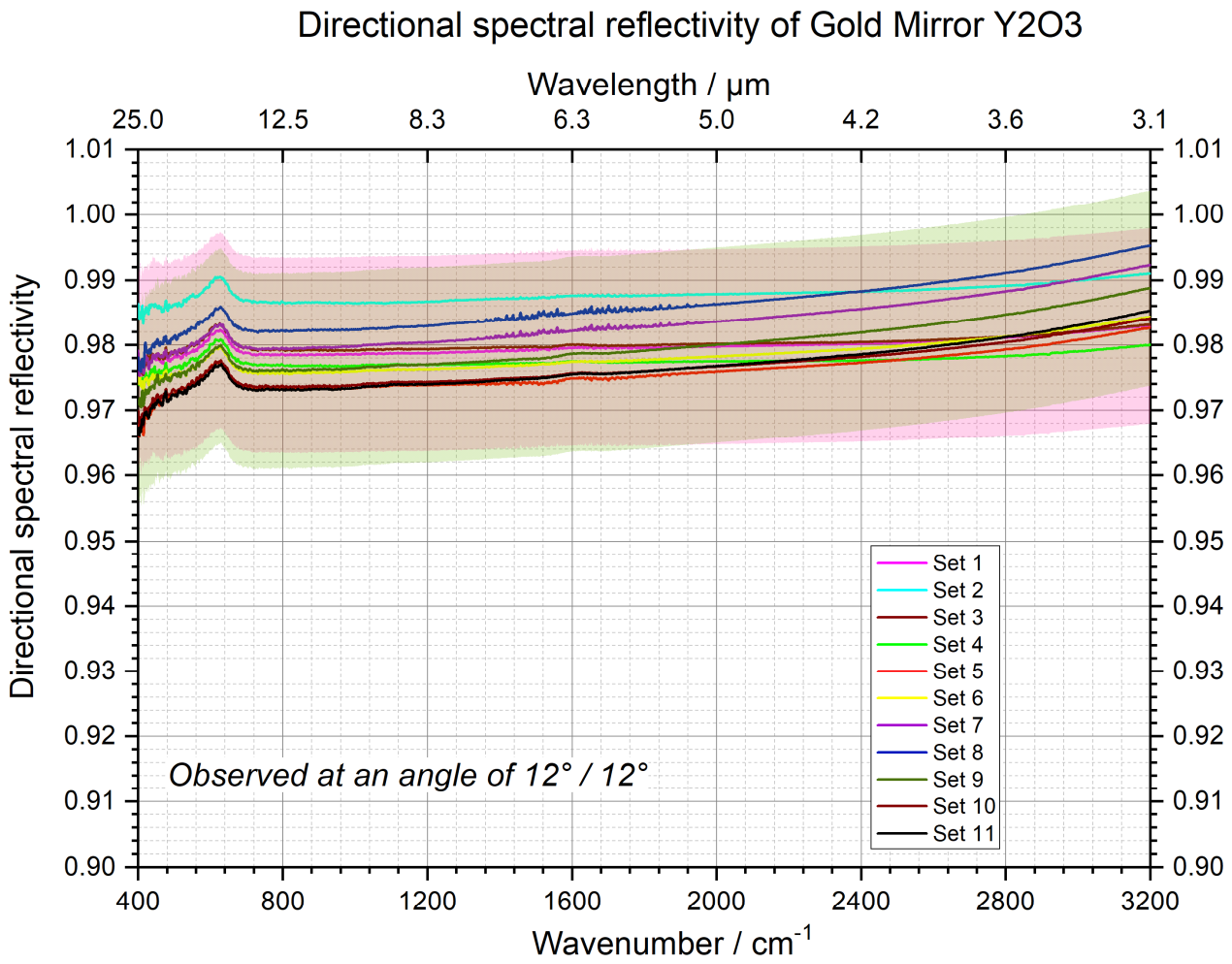


- *Significant sample to sample variation only of the Gold Laser Structured samples*

Variation among preliminary reference samples



Variation among preliminary reference samples



Summary

- Each partner has received a set of five types of preliminary reference samples.

Low emissivity:	Specular samples:	Medium emissivity:	High emissvity:	High emissvity:
Infragold coatings	Ultra-Precision Technology	Laser-structured and gold plated, PTB workshop	Nextel, PTB workshop	Aremco Black coating, LNE

- PTB has calibrated the total hemispherical emissivity of the preliminary reference samples with the target uncertainty of 0.03.