

STELLAR RESOURCES LTD

HEEMSKIRK TIN PROJECT Golf Course Zn-Pb-Sn Vein Mineragraphy

JANUARY 2015



McArthur Ore Deposit Assessments Pty Ltd

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STELLAR RESOURCES LTD

Heemskirk Tin Project

Golf Course Mineragraphy

January 2015

Method

Ray Hazeldene (Stellar Resources, Tasmania) requested a mineragraphic assessment of previously unknown Sn mineralisation in a grab sample from an old dump near the Zeehan Golf Course, close to the Severn Deposit which forms part of Stellar's Heemskirk Tin Project in Western Tasmania. Due to the textural variation across the vein, two polished thin sections were prepared by Simon Stephens (Hobart, TAS) with the offcuts submitted to ALS (Burnie, TAS) for assaying.

The assessment was undertaken in two stages: quantitative logging and qualitative photographic mineragraphy. To quantify the liberation characteristics, a simple method was adopted. For each polished section, 300 "grains" (centred on a 1.8mm square grid) were logged across the slide using a 53µm circular mask to simulate a ~53µm grind. For each "grain" the area% of each mineral present was visually estimated. The minerals logged were *pyrite* (Py), *pyrrhotite* (Po), *cassiterite* (Cs), *stannite* (St), *galena* (Gn), *sphalerite* (Sp), *chalcopyrite* (Cp), and gangue (*quartz, siderite, carbonaceous matter, etc*; Ga).

During all scans, the textural style of each grain was recorded to allow production of grain maps.

About 15 representative photomicrographs were taken of the two polished thin sections at various scales, to document the mineragraphic textures. These were annotated in PowerPoint format.

Overall Composition

Polished Section Offcut Assays

The sample offcuts when assayed by ALS gave the following results.

Golf Course Grab Offcut ALS Laboratory Assays (wt%)

Method	XRF	XRF	AAS	AAS	AAS	AAS
Analyte	%Fe	%Sn	%Cu	%Pb	%Zn	ppmAg
Golf Course Grab	6.09	4.2	0.06	19.55	38.9	587
cf Mineralogy Estimate	4.4	8.4	0	12.8	40.0	180

Quantitative Optical Microscopy

The results of the 53µm “grain” quantitative optical microscopy total scans are summarised below.

Golf Course Grab Optical Microscopy 53µm “Grains” Vol%

Sample	Py	Po	Cs	St	Gn	Sp	Cp	Ga
A	0.5	0.6	4.0	0	12.4	68.4	Tr	14.0
B	1.1	0.6	9.6	0	5.5	71.2	Tr	11.9
MEAN	0.8	0.6	6.8	0	9.0	69.8	Tr	13.0

*Py=pyrite, Po=pyrrhotite, Cs=cassiterite, St=stannite, Gn=galena, Sp=sphalerite, Cp=chalcopyrite, Ga=gangue
Tr means <0.05%, blank means not detected during the scan.*

Stannite was not detected.

Liberation and association parameters

Liberation parameters for the 53µm “grain” scans are summarised below. More detail is provided later in the report.

*Golf Course Grab Optical Microscopy 53µm “Grains” **Cassiterite** Distribution%*

Sample	%Free	%Binary	%Ternary+	%Associated with					
				Py	Po	St	Gn	Sp	Ga
A	8	69	23	0	2	0	24	84	7
B	10	72	18	2	8	0	9	73	18
MEAN	9	71	19	1	6	0	13	76	15

Cassiterite shows a higher association with *sphalerite* than with *galena*.

Golf Course Grab Optical Microscopy 53µm "Grains" Sphalerite Distribution%

Sample	%Free	%Binary	%Ternary+	%Associated with					
				Py	Po	Cs	St	Gn	Ga
A	17	55	28	11	42	7	0	29	23
B	18	53	29	16	43	23	0	15	16
MEAN	18	54	29	14	43	15	0	22	19

There is a strong association of *sphalerite* with *pyrrhotite*.

Golf Course Grab Optical Microscopy 53µm "Grains" Galena Distribution%

Sample	%Free	%Binary	%Ternary+	%Associated with					
				Py	Po	Cs	St	Sp	Ga
A	35	50	13	4	0	1	0	40	34
B	54	22	24	7	1	16	0	22	24
MEAN	41	41	16	5	0	6	0	34	31

Galena is more liberated and therefore coarser-grained than *sphalerite*.

Textural Features

The reader is referred to the annotated photomicrographs which follow.

The hand specimen shows a *sphalerite* vein with coarse *galena* on one side. Within the massive *sphalerite*, tin was detected by the client using a Niton portable XRF. On closer examination, pale *cassiterite* can be clearly seen with the naked eye.

Microscopically, there are several textural features that are noteworthy:

- The *sphalerite* is dusted with ultrafine *pyrrhotite* "disease"
- Early, tightly-packed, equant *sphalerite* crystals appear to be infilled by later, vuggy crystalline *cassiterite* (possibly replacing original carbonate?)
- *Galena* has been remobilised late, partially replacing *sphalerite*
- Fragments of recrystallised *carbonaceous matter* occur in the *sphalerite* and *cassiterite*, probably sourced from nearby black shales
- The gangue is 90% *quartz* and 10% carbonate (probable *siderite*)

The author has not previously recorded late *cassiterite* interstitial to subhedral *sphalerite*. As Pb-Zn veins are commonly observed on the outer fringes (lower temperature zones) of Sn deposits in Western Tasmania (Mt Bischoff, Cleveland, Renison) it can only be deduced that this Golf Course Sn mineralisation represents a deposition of the higher-temperature *cassiterite* over a pre-existing lower-temperature Zn-Pb vein system.

G.J.McArthur PhD FAusIMM MMICA MSEG
Principal Mineralogist
13.1.15

BU14198981 - Finalized

CLIENT : "STERES - Stellar Resources"

of SAMPLES : 1

DATE RECEIVED : 2014-12-24 DATE FINALIZED : 2015-01-13

PROJECT : "Stellar Res."

CERTIFICATE COMMENTS : ""

PO NUMBER : " "

	ME-ICP41a	ME-ICPDil	ME-XRF15d						
SAMPLE	Cu	Pb	Zn	Ag	Fe	As	Sn	Zn	Sn
DESCRIPTI	ppm	ppm	ppm	ppm	%	ppm	ppm	%	%
Golf Course	604	195500	>370000		587	6.09 <10	1600	38.9	4.2

Sample Scan

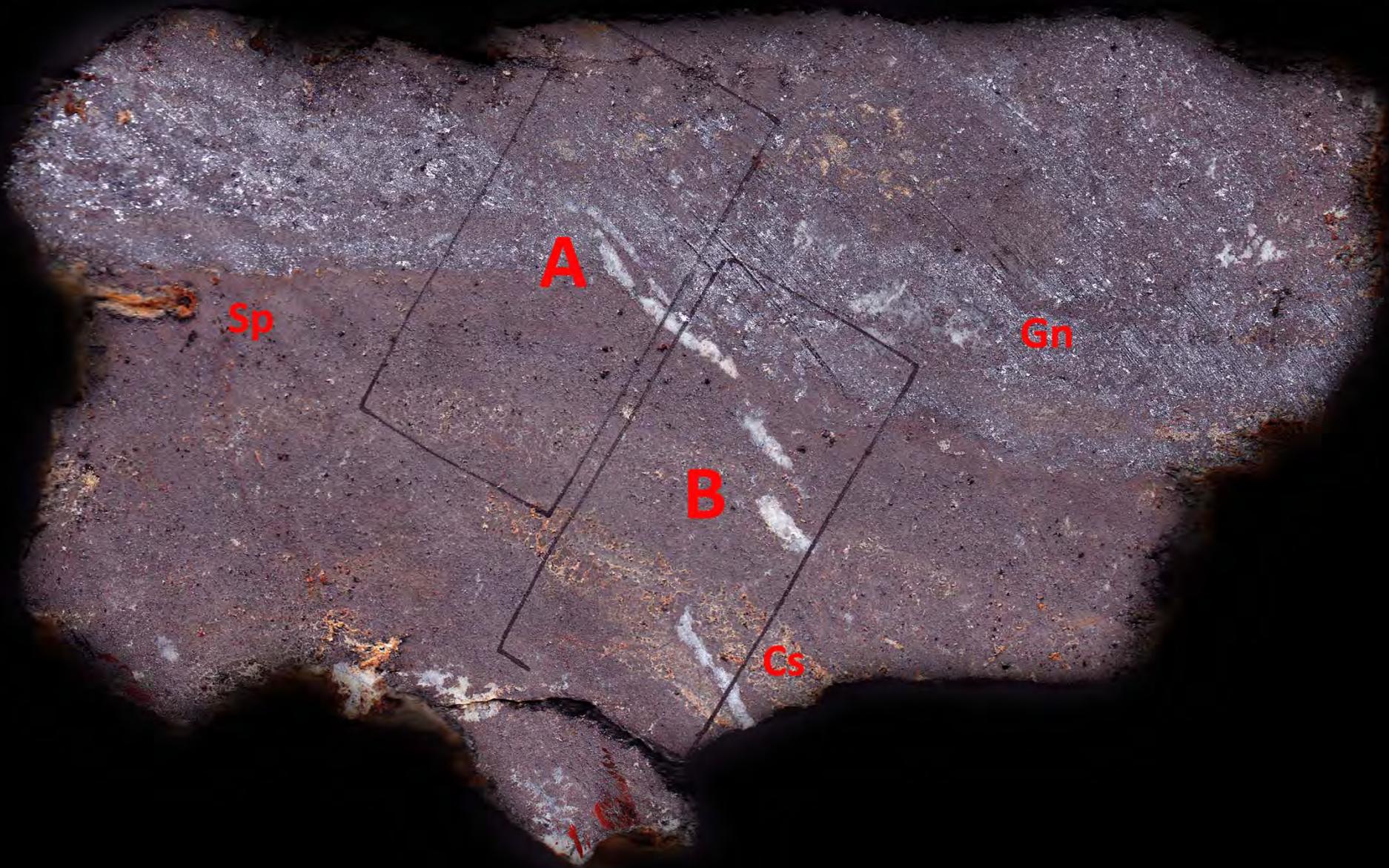


Image width 150mm

Golf Course

Golf Course A

January 2015

GJMcA 2.1.15

53µm mask	
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Average composition - all grains

Py	Po	Cs	St	Gn	Sp	Cp	Ga	n
0.5	0.6	4.0	0.0	12.4	68.4	0.0	14.0	300
6	2	40	3	36	81	1	40	

ASSAYS

	SG	Sn	Cu	Pb	Zn	Ag	Fe
Calc'd	4.41	5.00	0.0	17.7	39.0	249	4.2
Actual		4.20	0.1	19.6	38.9	587	6.1

COMPOSITE PROPORTIONS

	Py	Po	Cs	St	Sp	Gn	Ga	
Mono	0	0	8	0	17	35	41	
Binary	31	69	69	100	55	50	38	
Ternary	65	28	21	0	25	13	18	
Quat.y+	4	2	2	0	3	0	2	
#Grains	8.7	30.0	9.7	0.3	84.7	37.3	34.7	2.05

BINARY ASSOCIATION MATRIX

	Py	Po	Cs	St	Sp	Gn	Ga
Py		0	0	0	61	39	0
Po	0		0	0	100	0	0
Cs	0	0		0	89	11	0
St	0	0	0		0	0	100
Sp	6	51	6	0		21	16
Gn	4	0	0	0	49		46
Ga	0	0	0	6	73	21	

TOTAL ASSOCIATION MATRIX

	Py	Po	Cs	St	Sp	Gn	Ga
Py		10	0	0	88	66	9
Po	6		2	0	100	14	10
Cs	0	2		0	84	24	7
St	0	0	0		0	0	100
Sp	11	42	7	0		29	23
Gn	4	0	1	0	40		34
Ga	1	1	4	2	49	25	

of
all

DISTRIBUTION MATRIX

	Free	Binary						Tern	Quat	
		Py	Po	Cs	St	Sp	Gn			Ga
Py	0		0	0	0	19	12	0	65	4
Po	0	0		0	0	69	0	0	28	2
Cs	8	0	0		0	61	8	0	21	2
St	0	0	0		0	0	0	100	0	0
Sp	17	3	28	3	0		12	9	25	3
Gn	35	2	0	0	0	24		23	13	0
Ga	41	0	0	0	2	28	8		18	2

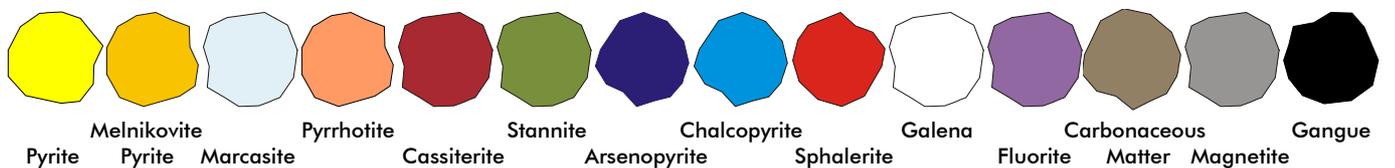
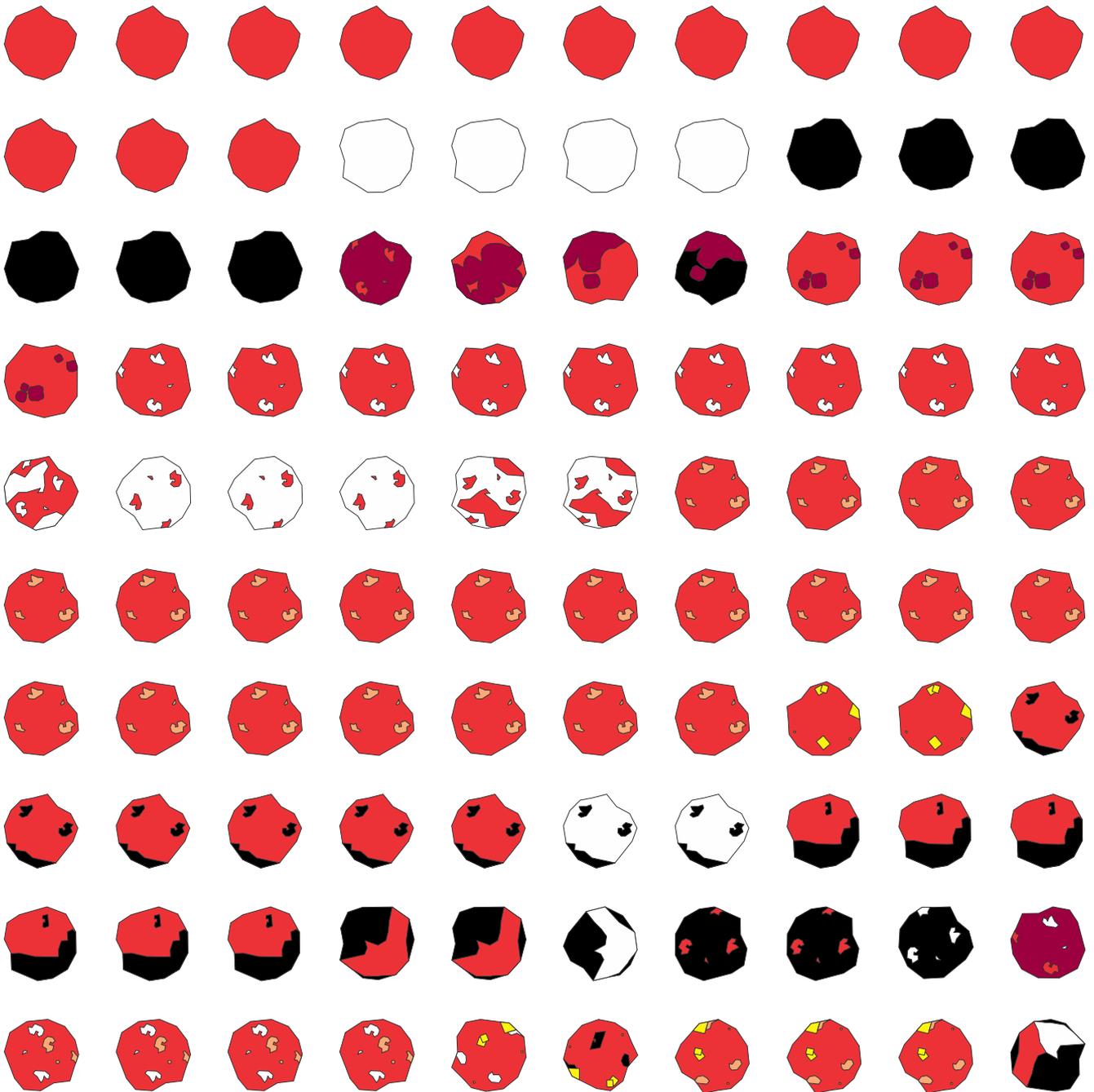
Heemskirk Tin Project - Rock Chip Mineralogy

Golf Course A

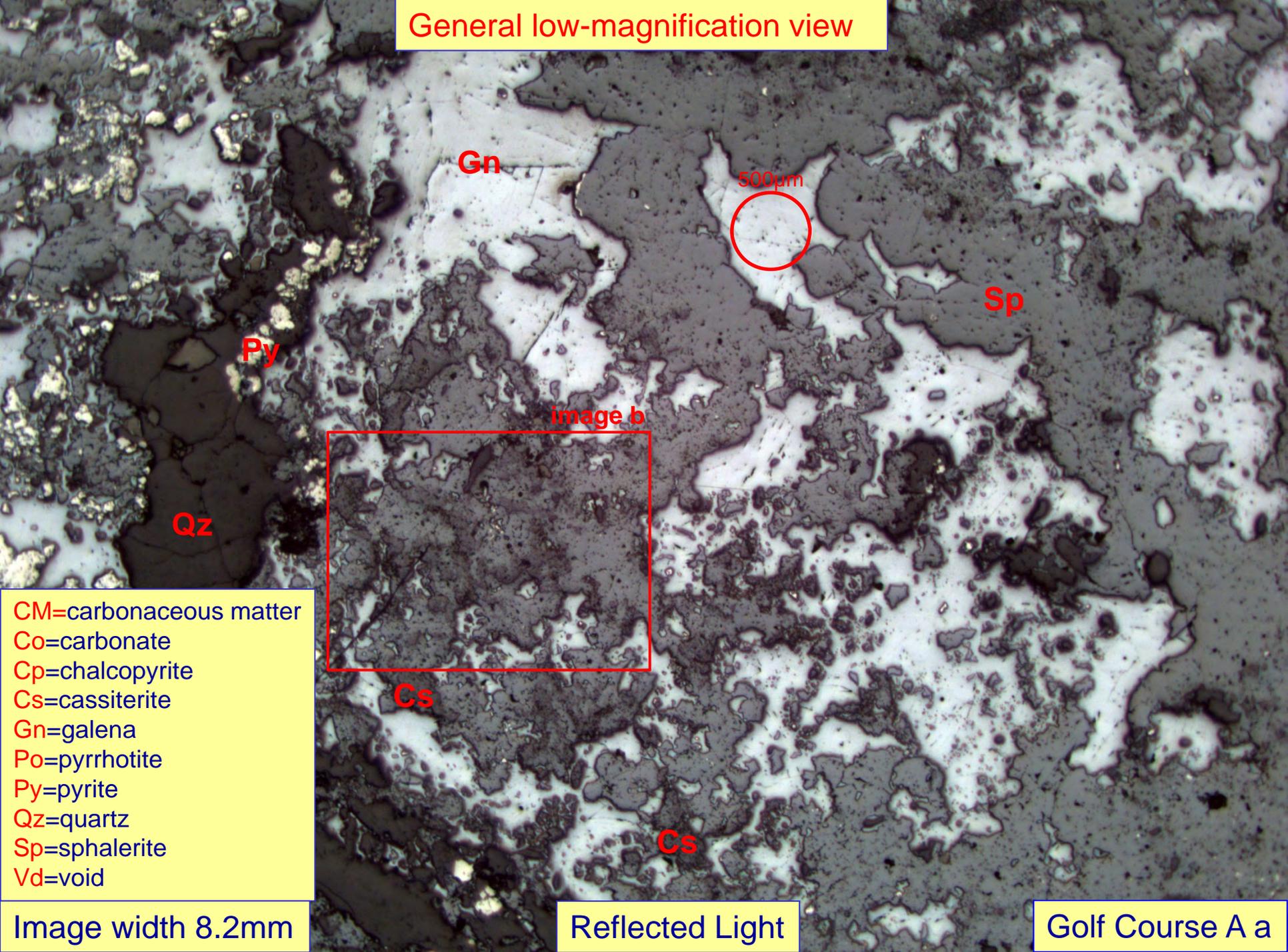
53µm mask

January

2015



General low-magnification view



Py

Qz

Gn

500µm

Sp

image b

Cs

Cs

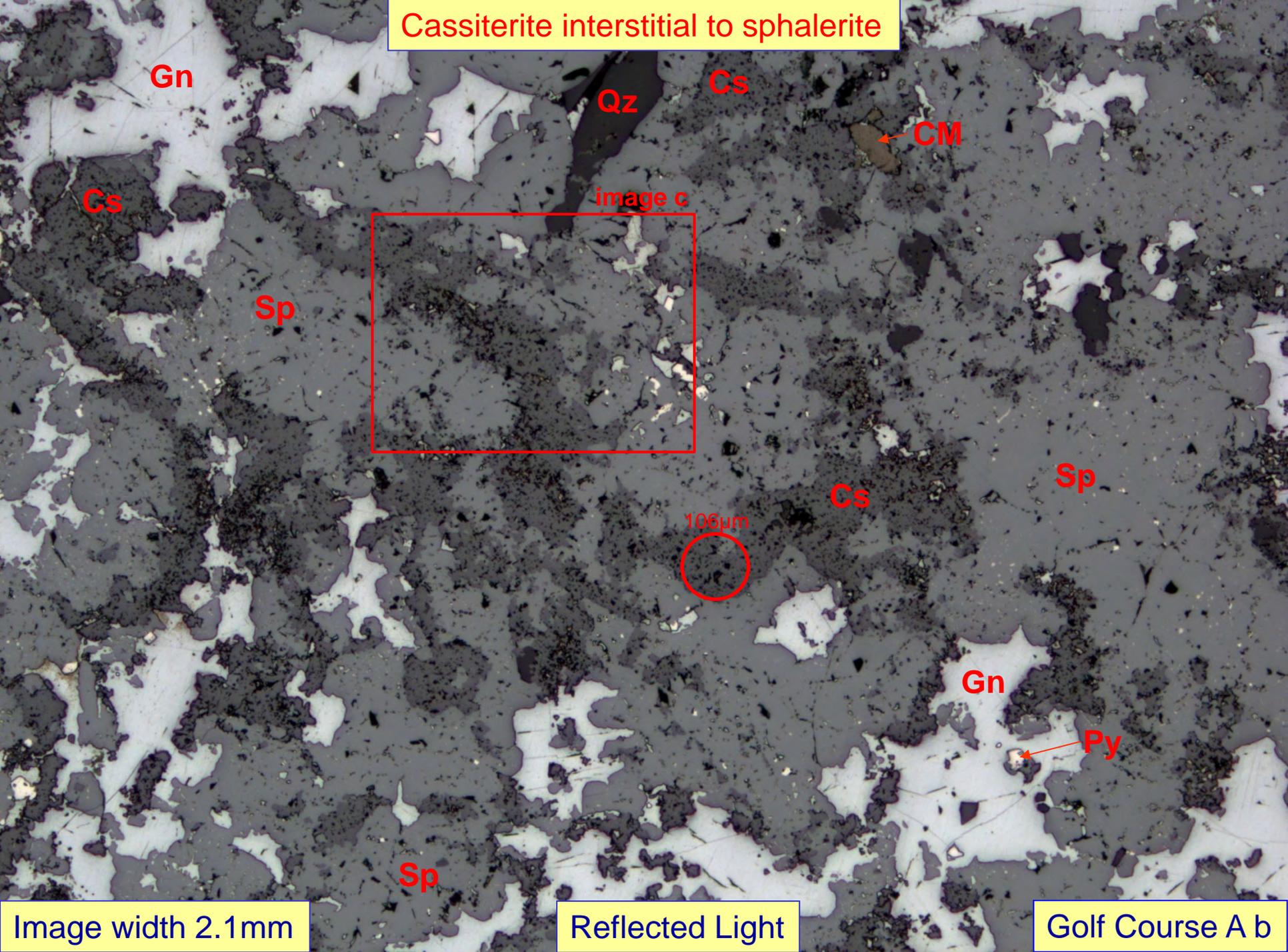
- CM=carbonaceous matter
- Co=carbonate
- Cp=chalcopyrite
- Cs=cassiterite
- Gn=galena
- Po=pyrrhotite
- Py=pyrite
- Qz=quartz
- Sp=sphalerite
- Vd=void

Image width 8.2mm

Reflected Light

Golf Course A a

Cassiterite interstitial to sphalerite



Gn

Cs

Qz

CM

Cs

image c

Sp

Sp

Cs

106µm

Gn

Py

Sp

Image width 2.1mm

Reflected Light

Golf Course A b

Detail from previous image

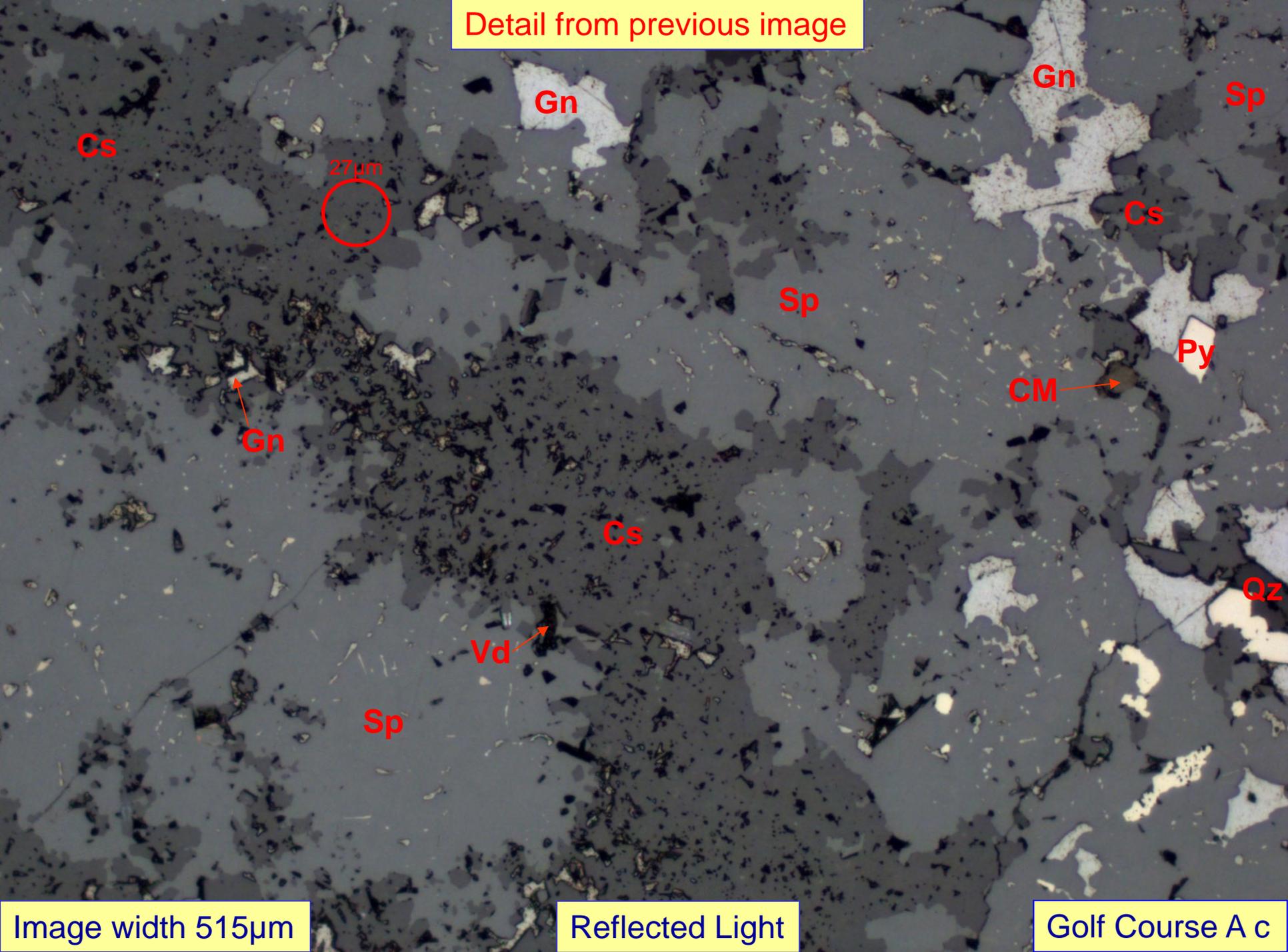
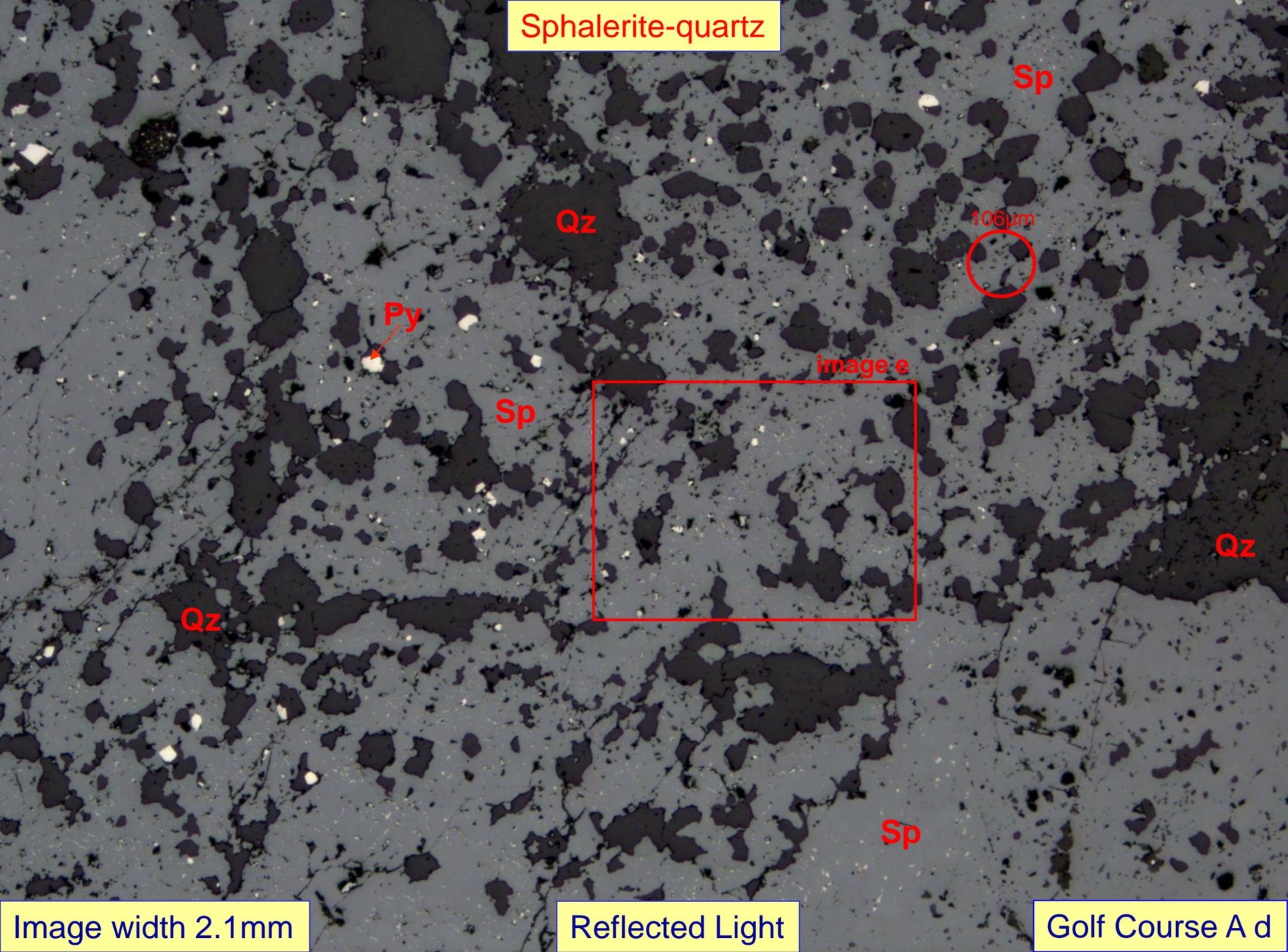


Image width 515µm

Reflected Light

Golf Course A c

Sphalerite-quartz



Sp

Qz

106µm

Py

Sp

image e

Qz

Qz

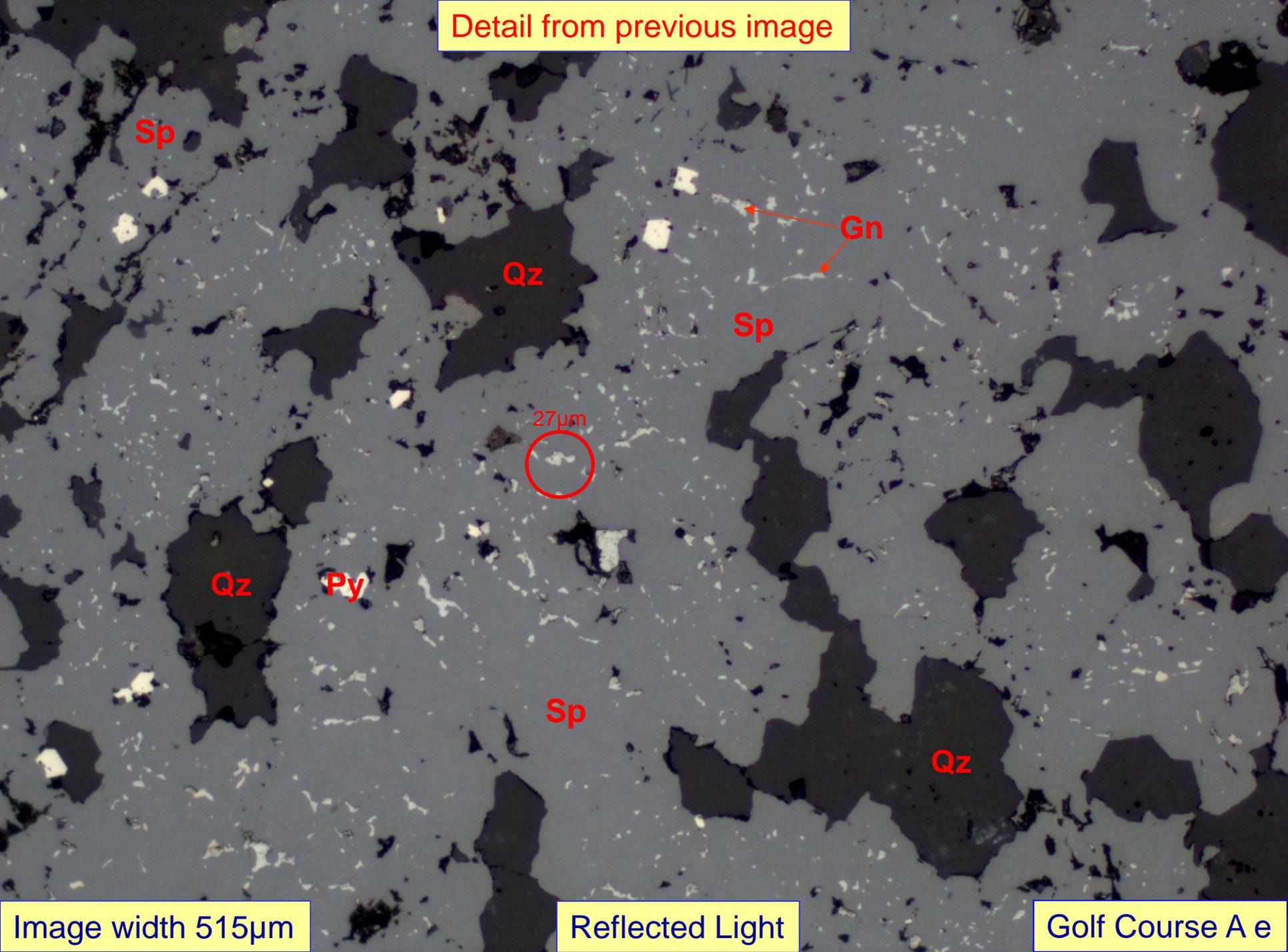
Sp

Image width 2.1mm

Reflected Light

Golf Course A d

Detail from previous image



Sp

Qz

Gn

Sp

27µm

Qz

Py

Sp

Qz

Image width 515µm

Reflected Light

Golf Course A e

Quartz vein with carbonaceous matter

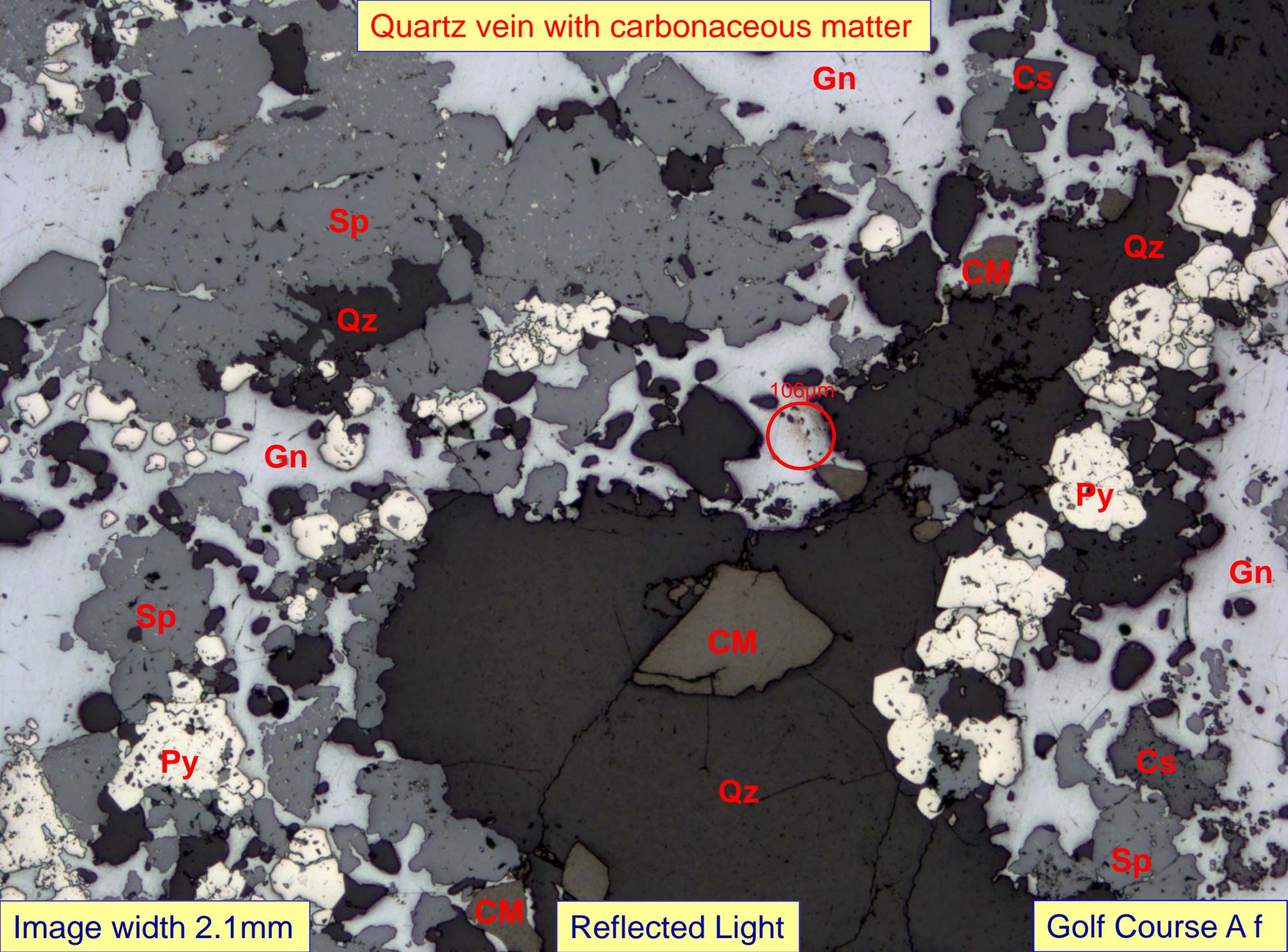
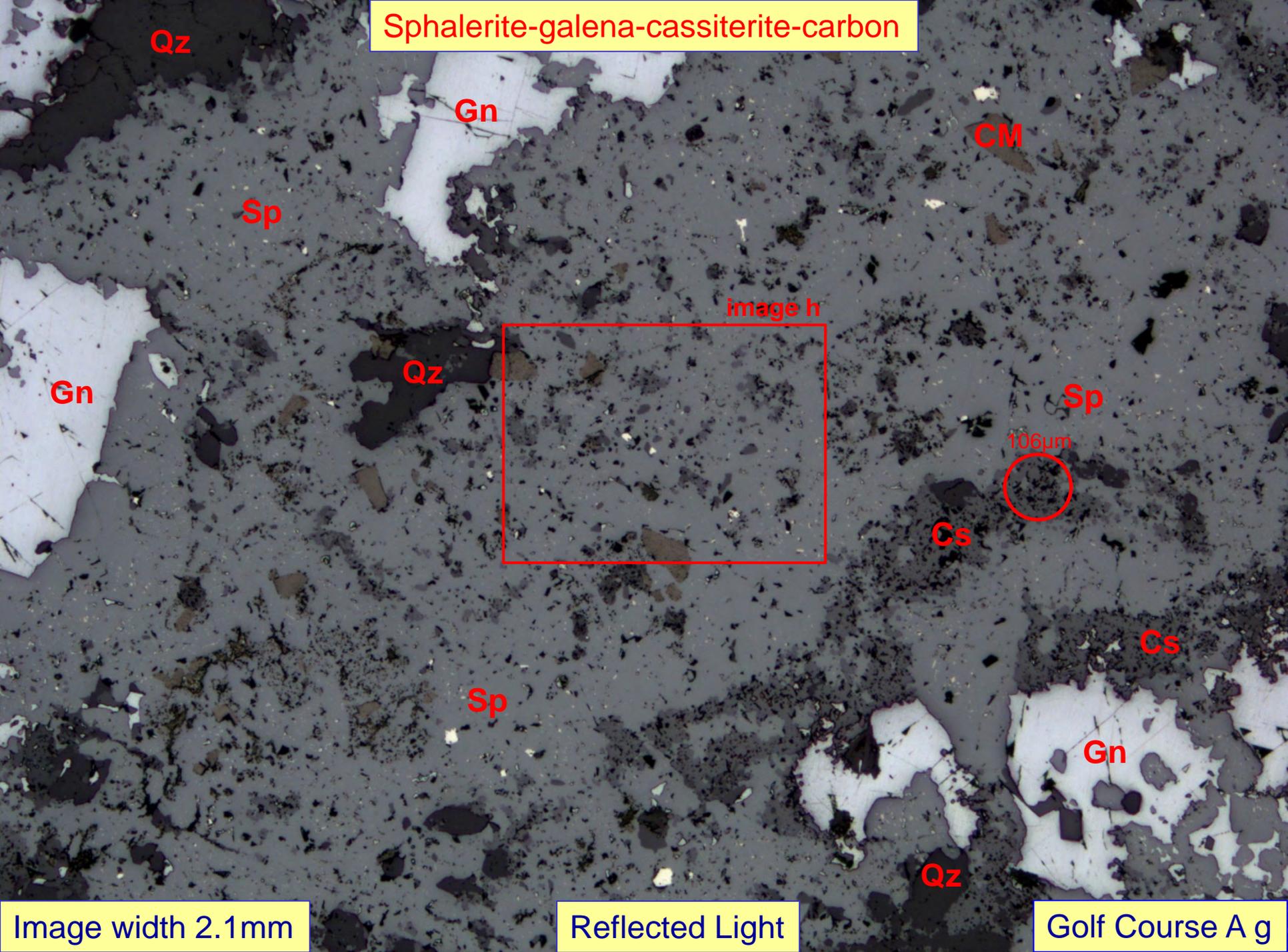


Image width 2.1mm

Reflected Light

Golf Course A f

Sphalerite-galena-cassiterite-carbon



Qz

Gn

CM

Sp

image h

Qz

Gn

Sp

106µm

Cs

Cs

Sp

Gn

Qz

Image width 2.1mm

Reflected Light

Golf Course A g

Detail from previous image

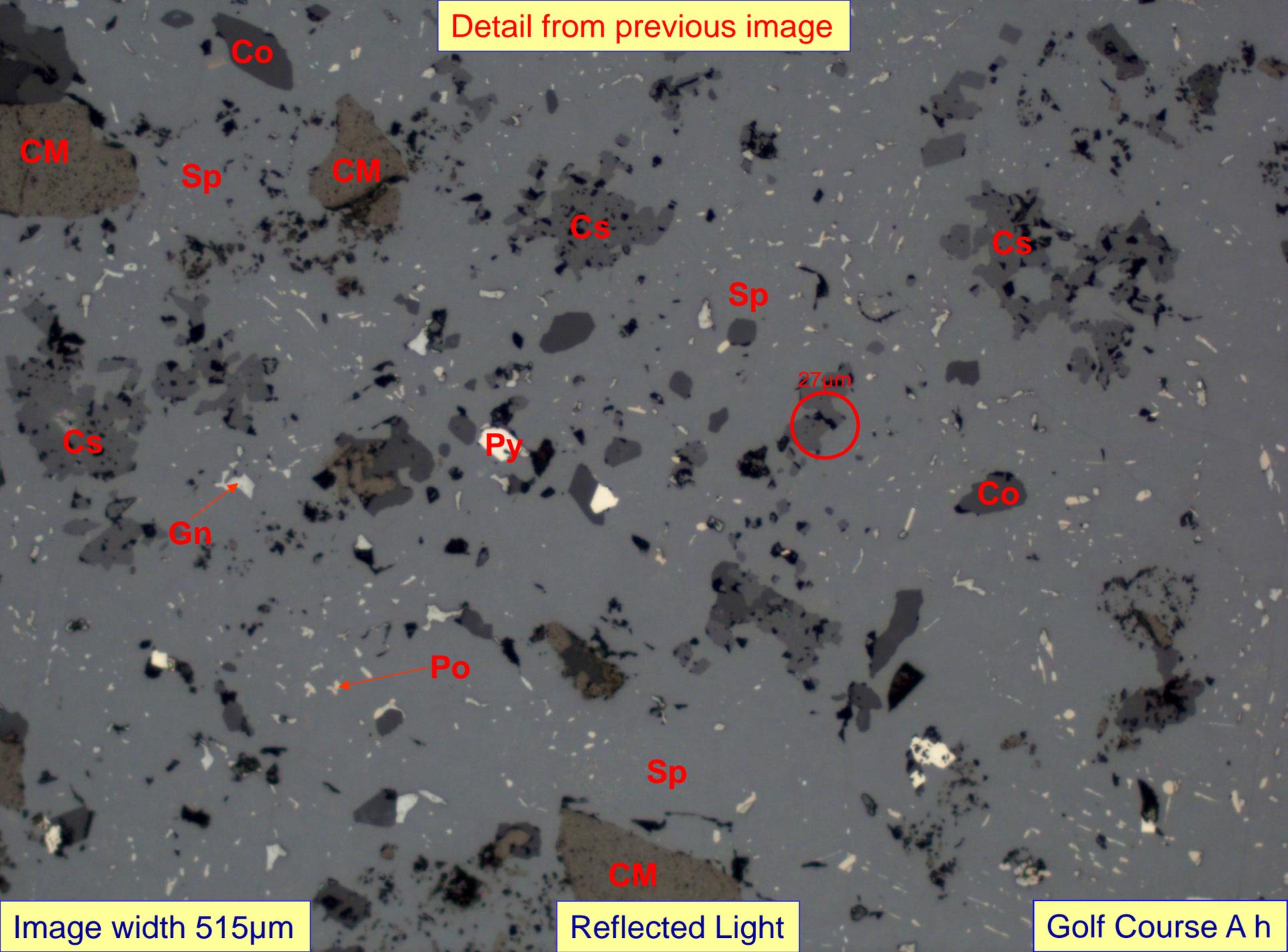
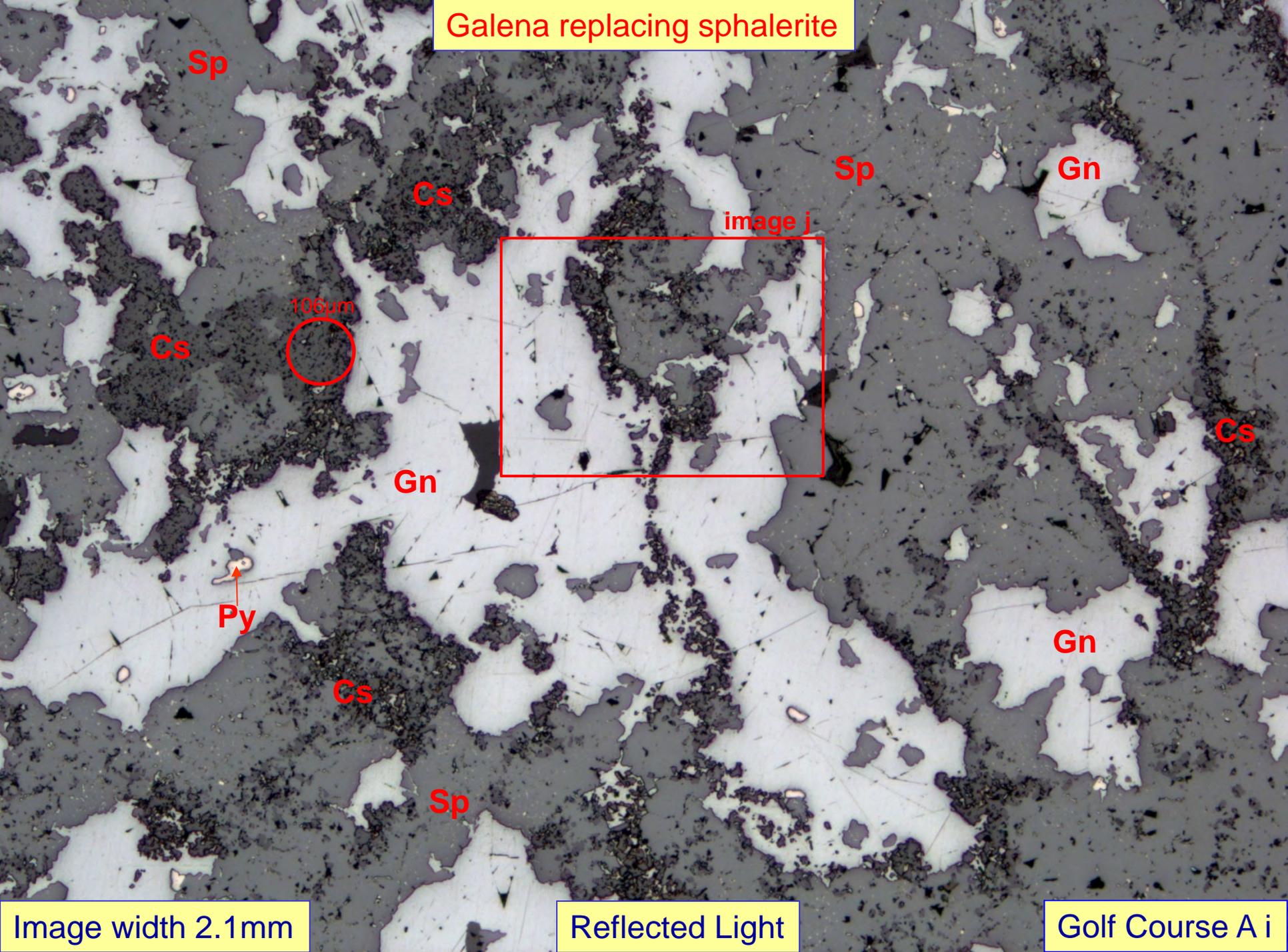


Image width 515µm

Reflected Light

Golf Course A h

Galena replacing sphalerite



Sp

Cs

Sp

Gn

image j

100µm

Cs

Cs

Gn

Py

Gn

Cs

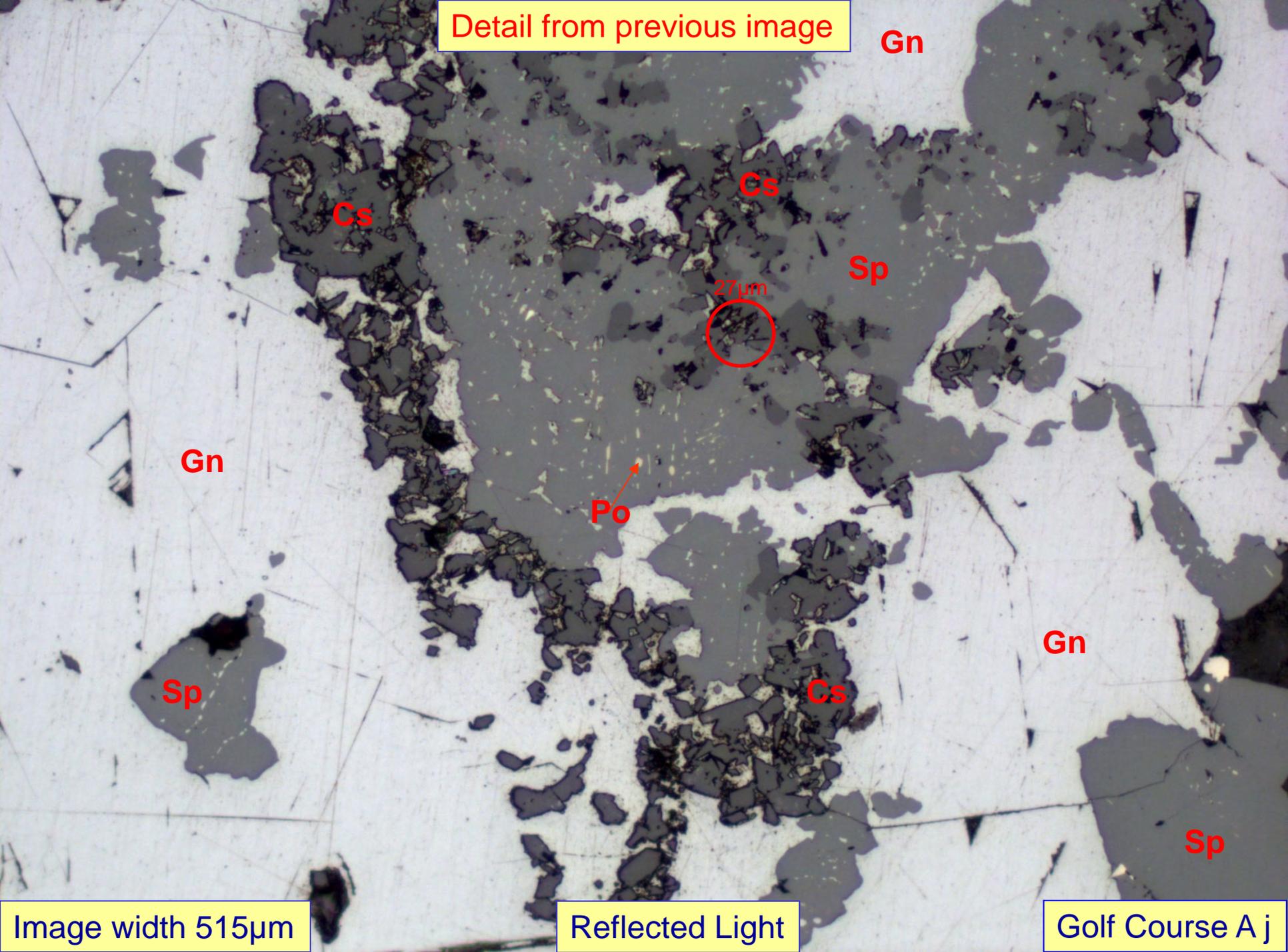
Sp

Image width 2.1mm

Reflected Light

Golf Course A i

Detail from previous image



Gn

Cs

Cs

Sp

27µm

Gn

Po

Sp

Cs

Gn

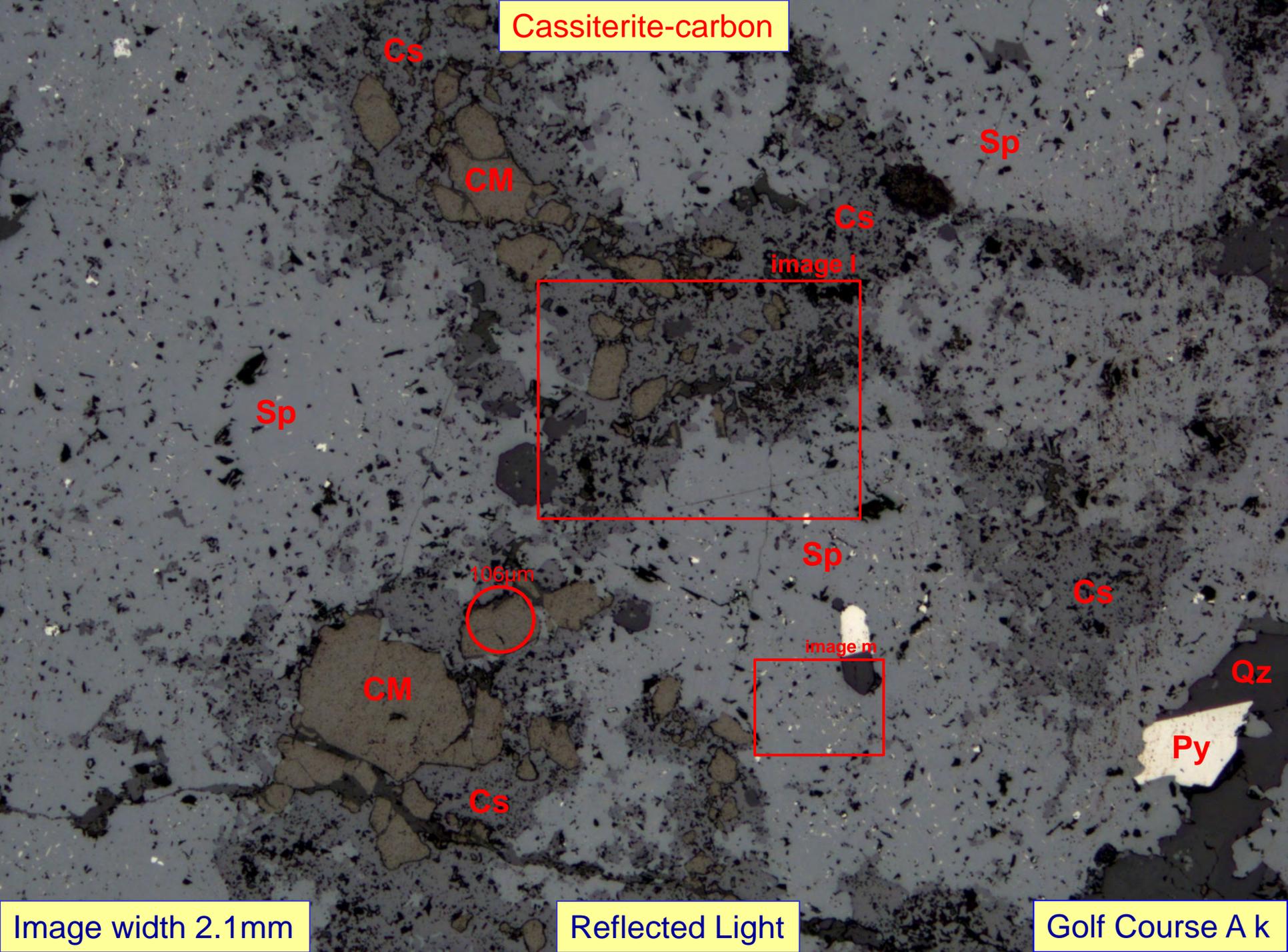
Sp

Image width 515µm

Reflected Light

Golf Course A j

Cassiterite-carbon



Sp

Cs

CM

Sp

Cs

image l

106um

Sp

Cs

CM

image m

Qz

Py

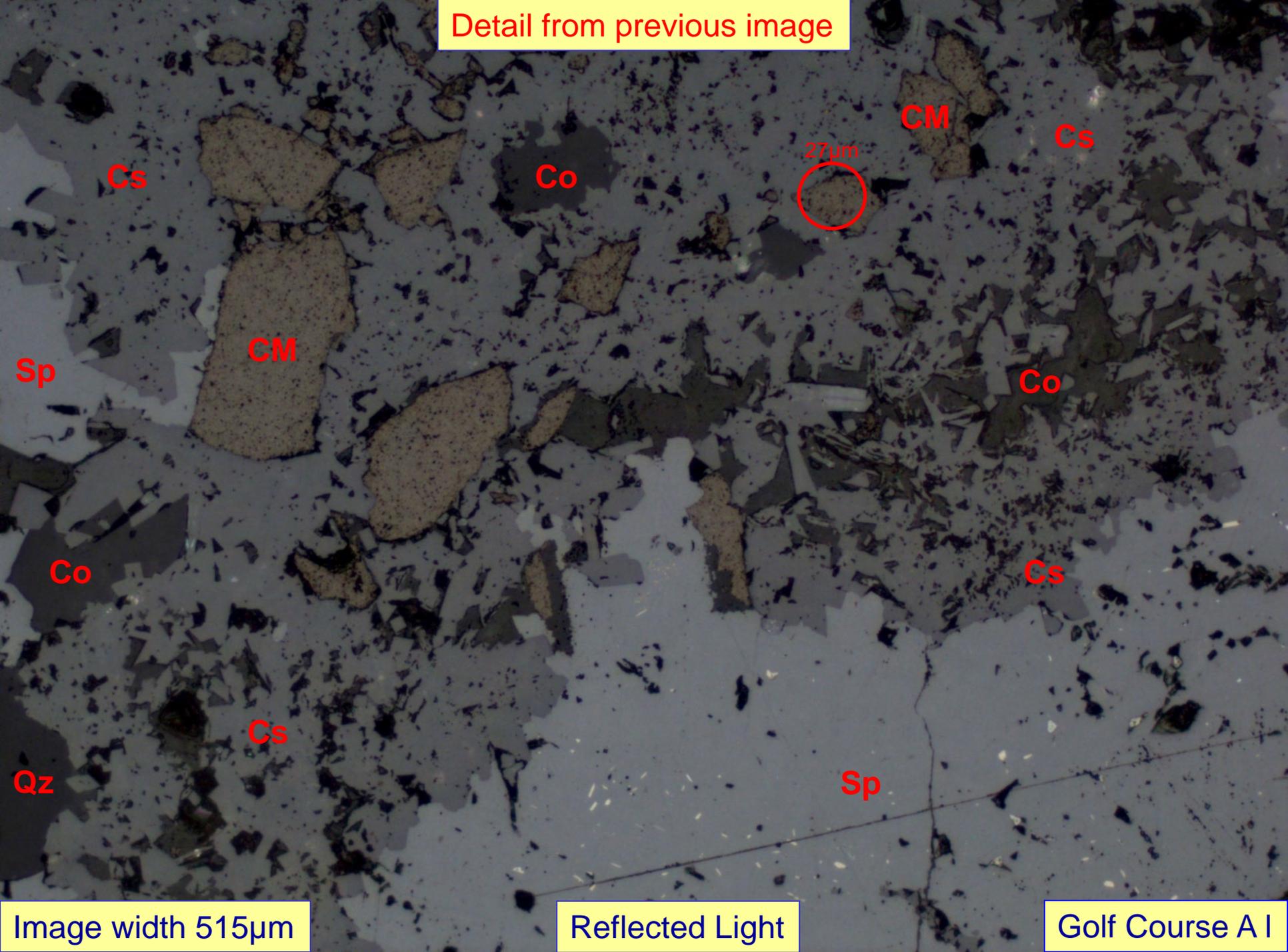
Cs

Image width 2.1mm

Reflected Light

Golf Course A k

Detail from previous image



Cs

Co

CM

Cs

27µm

CM

Sp

Co

Co

Cs

Cs

Sp

Qz

Image width 515µm

Reflected Light

Golf Course A I

Extreme detail from image k

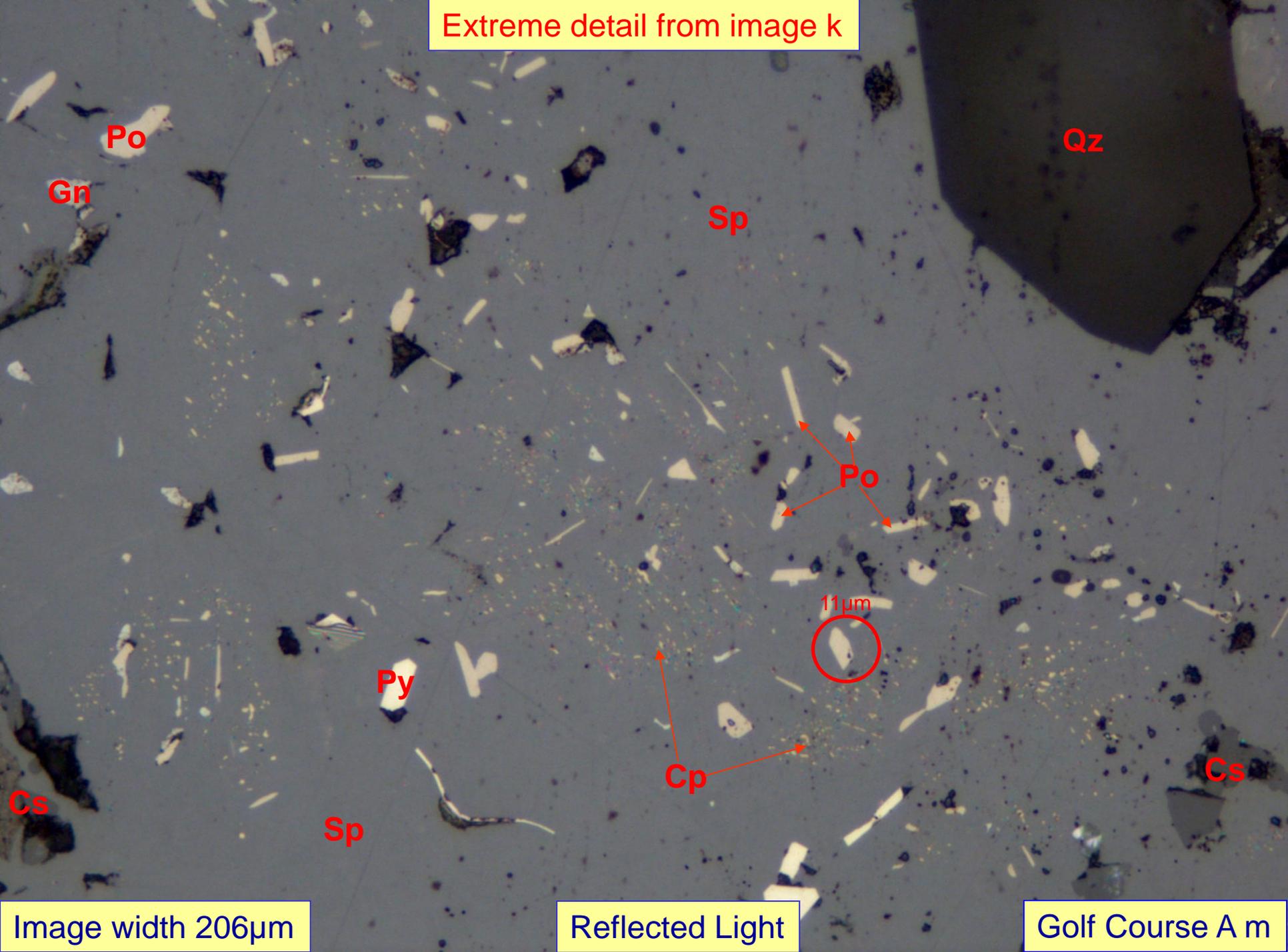


Image width 206µm

Reflected Light

Golf Course A m

Cassiterite rimming subhedral sphalerite

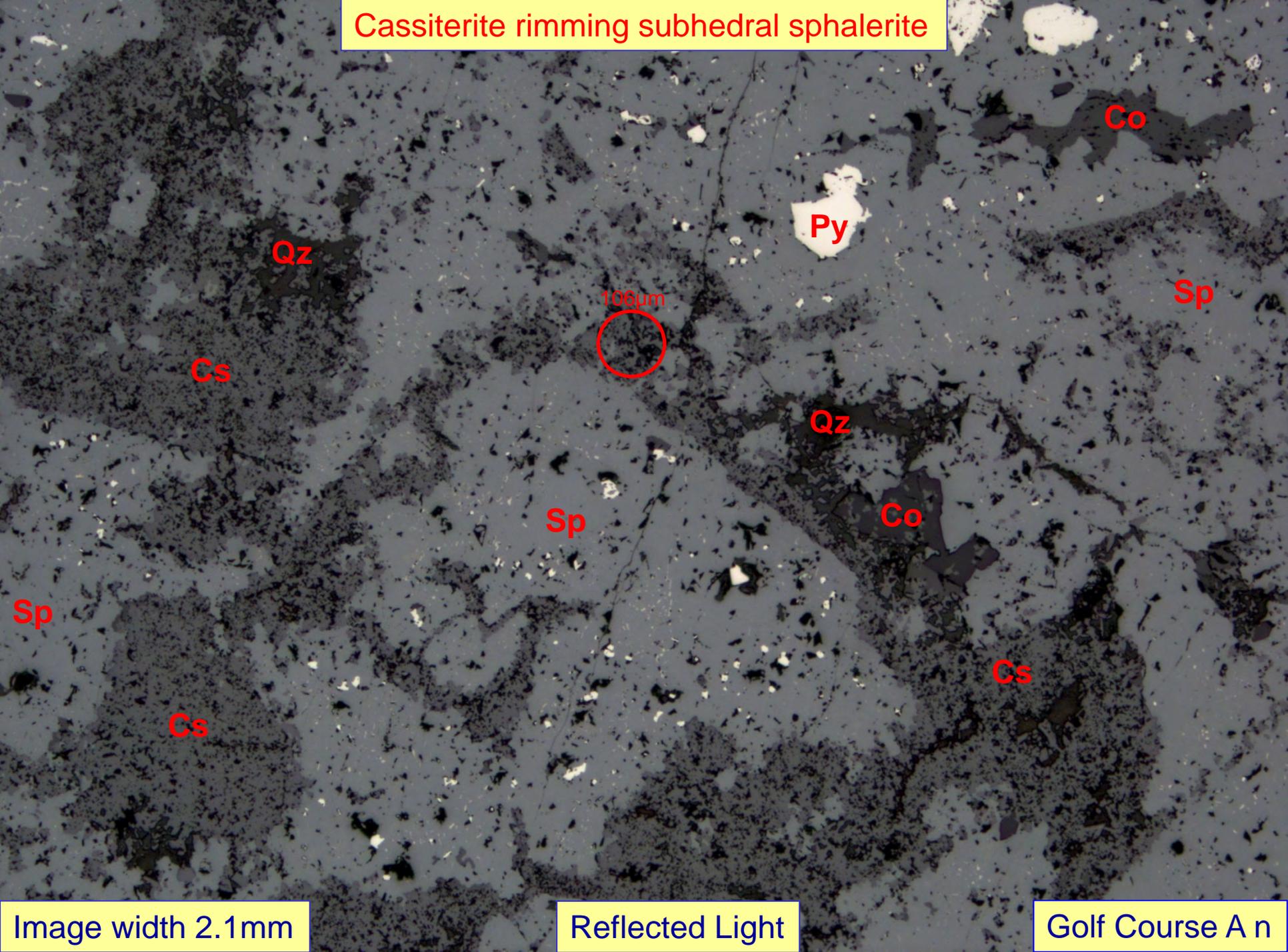


Image width 2.1mm

Reflected Light

Golf Course A n

Cassiterite rimming subhedral sphalerite

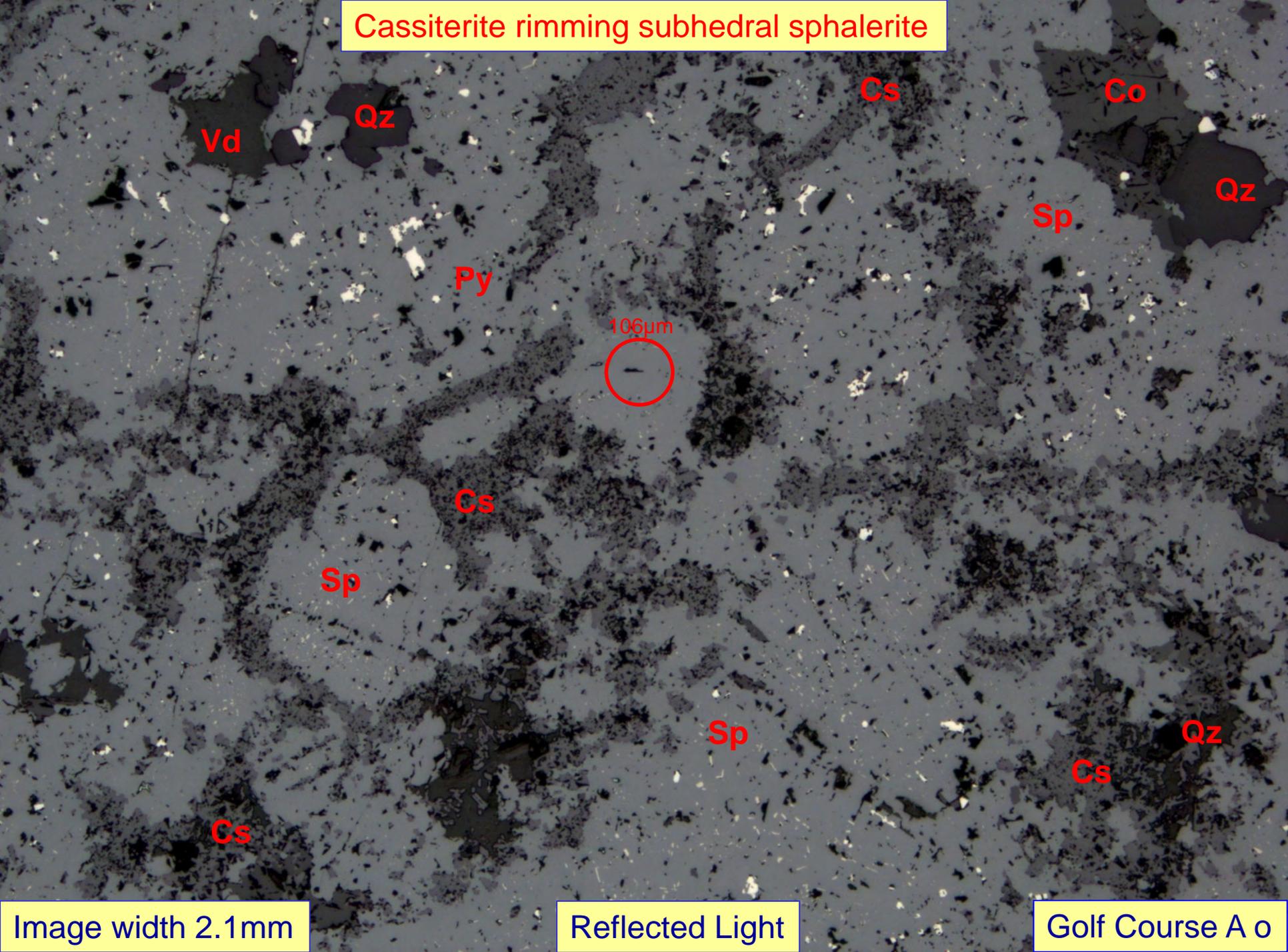


Image width 2.1mm

Reflected Light

Golf Course A o

Golf Course B

January 2015

GJMcA 2.1.15

53µm mask	
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Average composition - all grains

Py	Po	Cs	St	Gn	Sp	Cp	Ga	n
1.1	0.6	9.6	0.0	5.5	71.2	0.0	11.9	300
8	2	32	0	30	84	1	44	

ASSAYS

	SG	Sn	Cu	Pb	Zn	Ag	Fe
Calc'd	4.37	11.86	0.0	7.9	41.0	111	4.6
Actual		4.20	0.1	19.6	38.9	587	6.1

COMPOSITE PROPORTIONS

	Py	Po	Cs	St	Sp	Gn	Ga
Mono	32	0	10	0	18	54	64
Binary	10	63	72	0	53	22	18
Ternary	26	28	15	0	24	22	13
Quat.y+	32	9	3	0	5	2	5
#Grains	14.0	32.7	29.0	0.0	84.7	18.3	27.0

BINARY ASSOCIATION MATRIX

	Py	Po	Cs	St	Sp	Gn	Ga
Py		0	0	0	100	0	0
Po	0		2	0	98	0	0
Cs	0	5		0	78	5	13
St	0	0	0		0	0	0
Sp	9	49	20	0		9	13
Gn	0	0	28	0	46		25
Ga	0	0	6	0	92	2	

TOTAL ASSOCIATION MATRIX

	Py	Po	Cs	St	Sp	Gn	Ga
Py		22	11	0	66	26	34
Po	12		13	0	99	17	6
Cs	2	8		0	73	9	18
St	0	0	0		0	0	0
Sp	16	43	23	0		15	16
Gn	7	1	16	0	22		24
Ga	5	1	14	0	32	7	

of
all

DISTRIBUTION MATRIX

	Binary							Fern	Quat	Quat
	Py	Po	Cs	St	Sp	Gn	Ga			
Py	32		0	0	0	10	0	0	26	32
Po	0	0		1	0	62	0	0	28	9
Cs	10	0	3		0	56	3	9	15	3
St	0	0	0	0		0	0	0	0	0
Sp	18	5	26	11	0		5	7	24	5
Gn	54	0	0	6	0	10		5	22	2
Ga	64	0	0	1	0	17	0		13	5

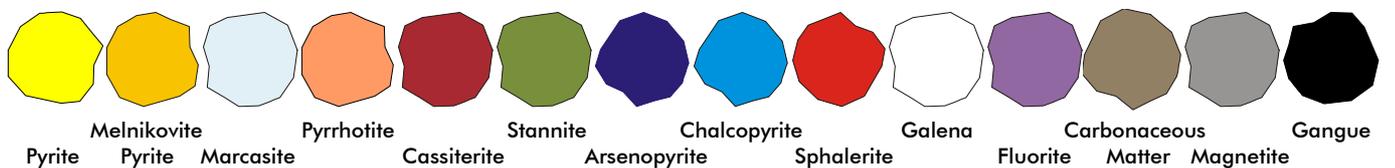
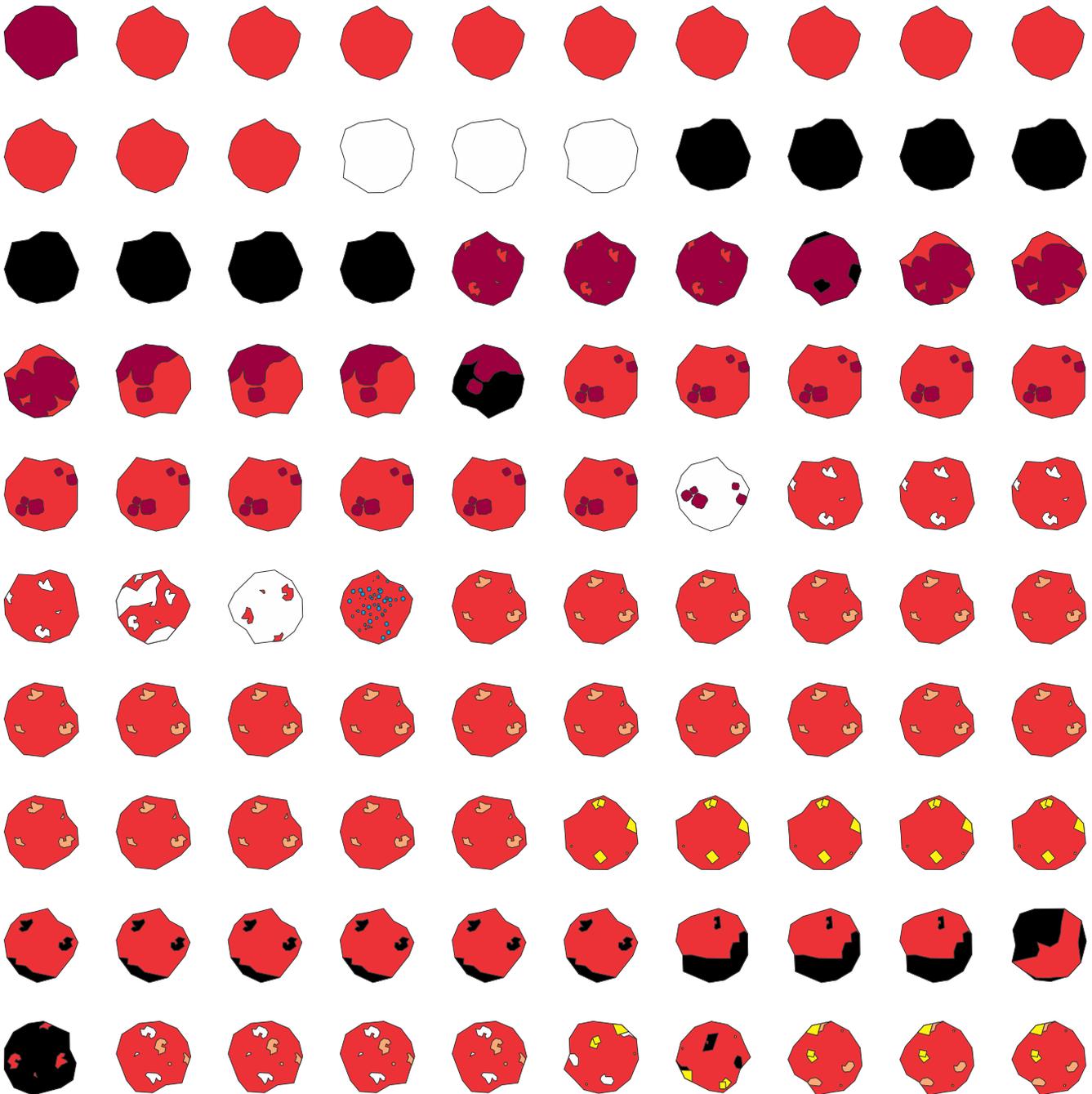
Heemskirk Tin Project - Rock Chip Mineralogy

Golf Course B

53µm mask

January

2015



General low-magnification view

Vd

Sp

Cs

500µm

Py

image b

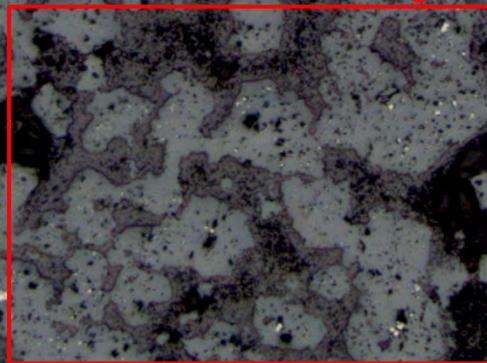
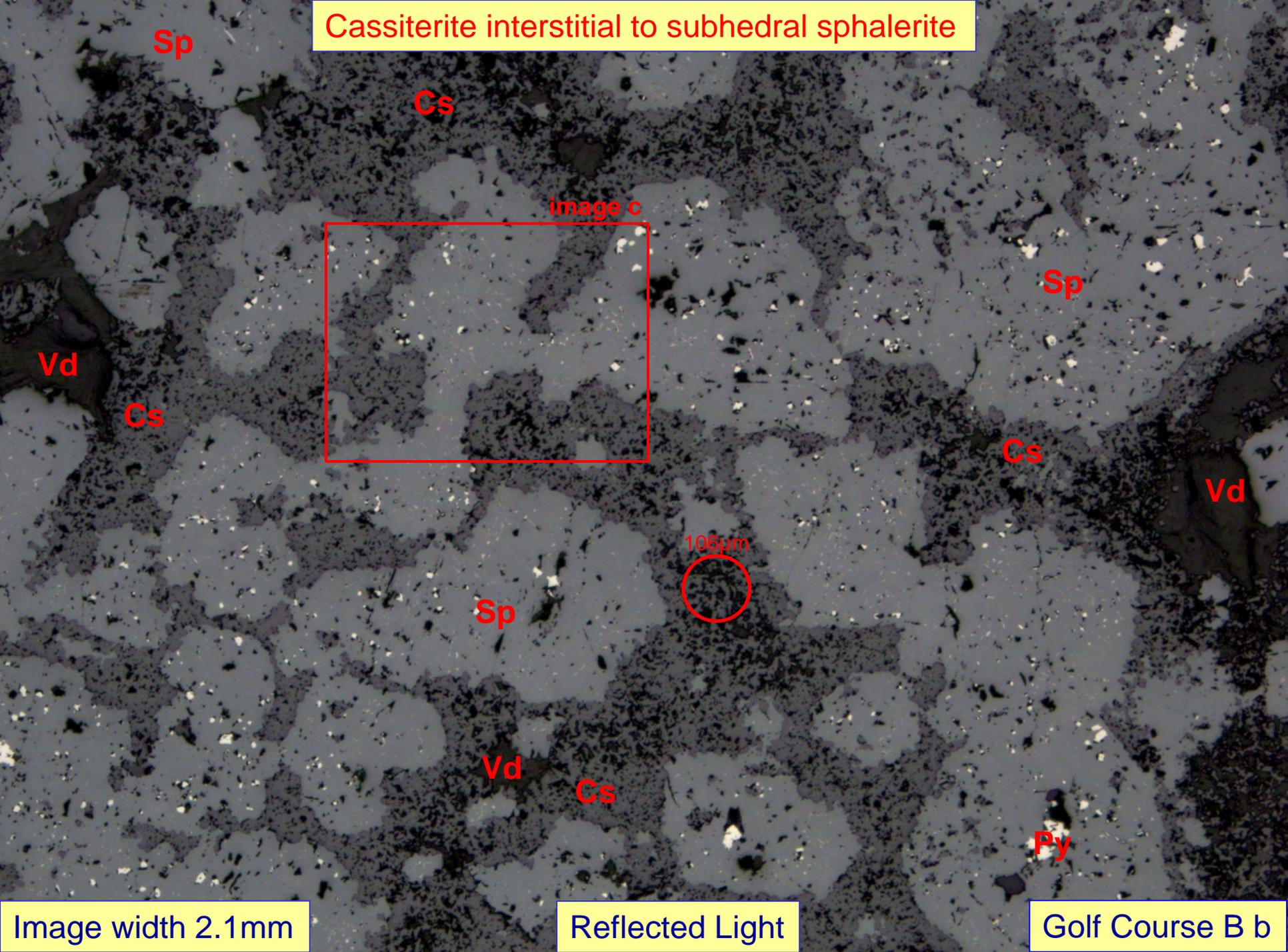


Image width 8.2mm

Reflected Light

Golf Course B a

Cassiterite interstitial to subhedral sphalerite



Sp

Cs

image c

Vd

Sp

Cs

Cs

Vd

106µm

Sp

Vd

Cs

Py

Image width 2.1mm

Reflected Light

Golf Course B b

Detail from previous image

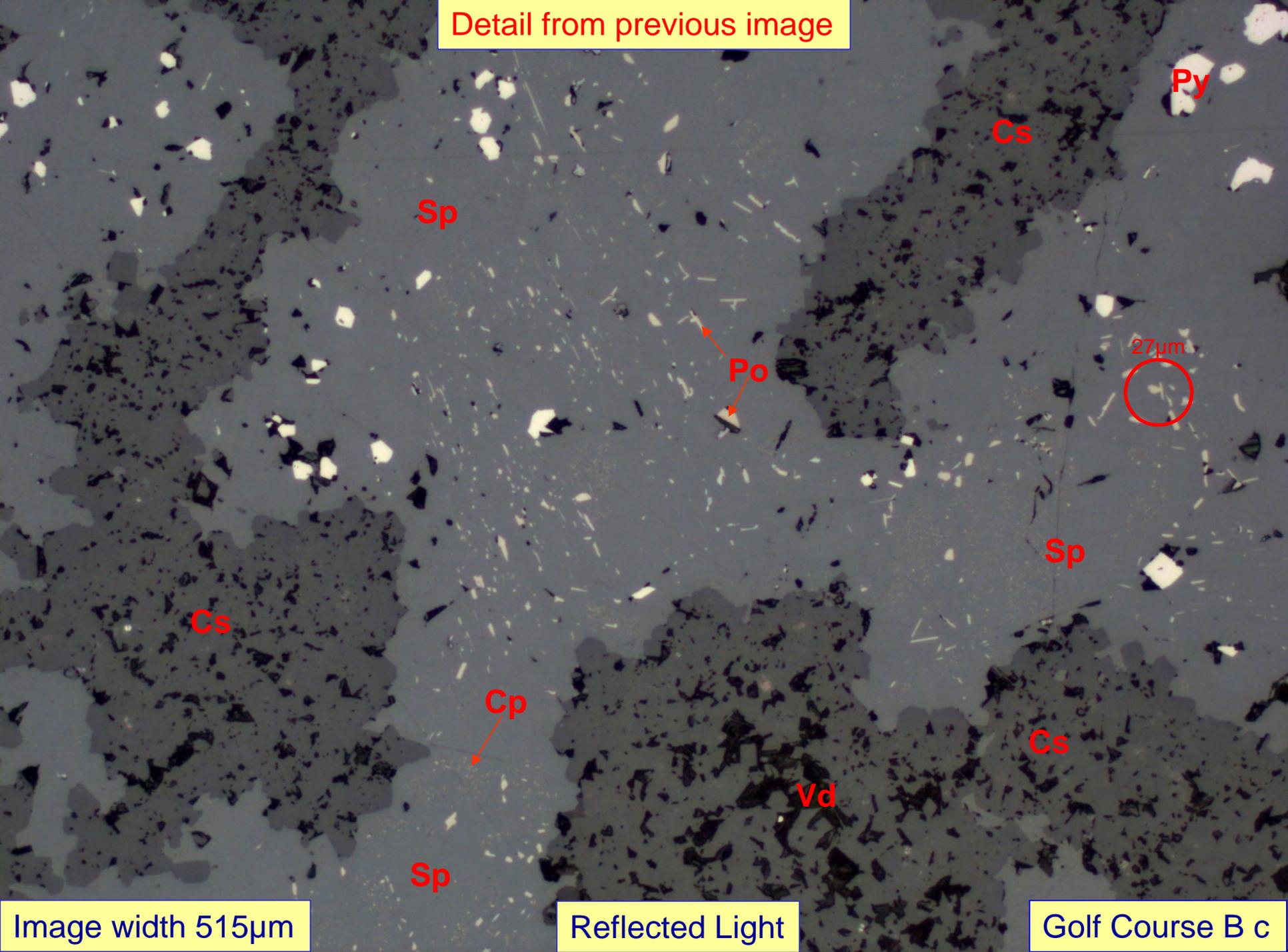
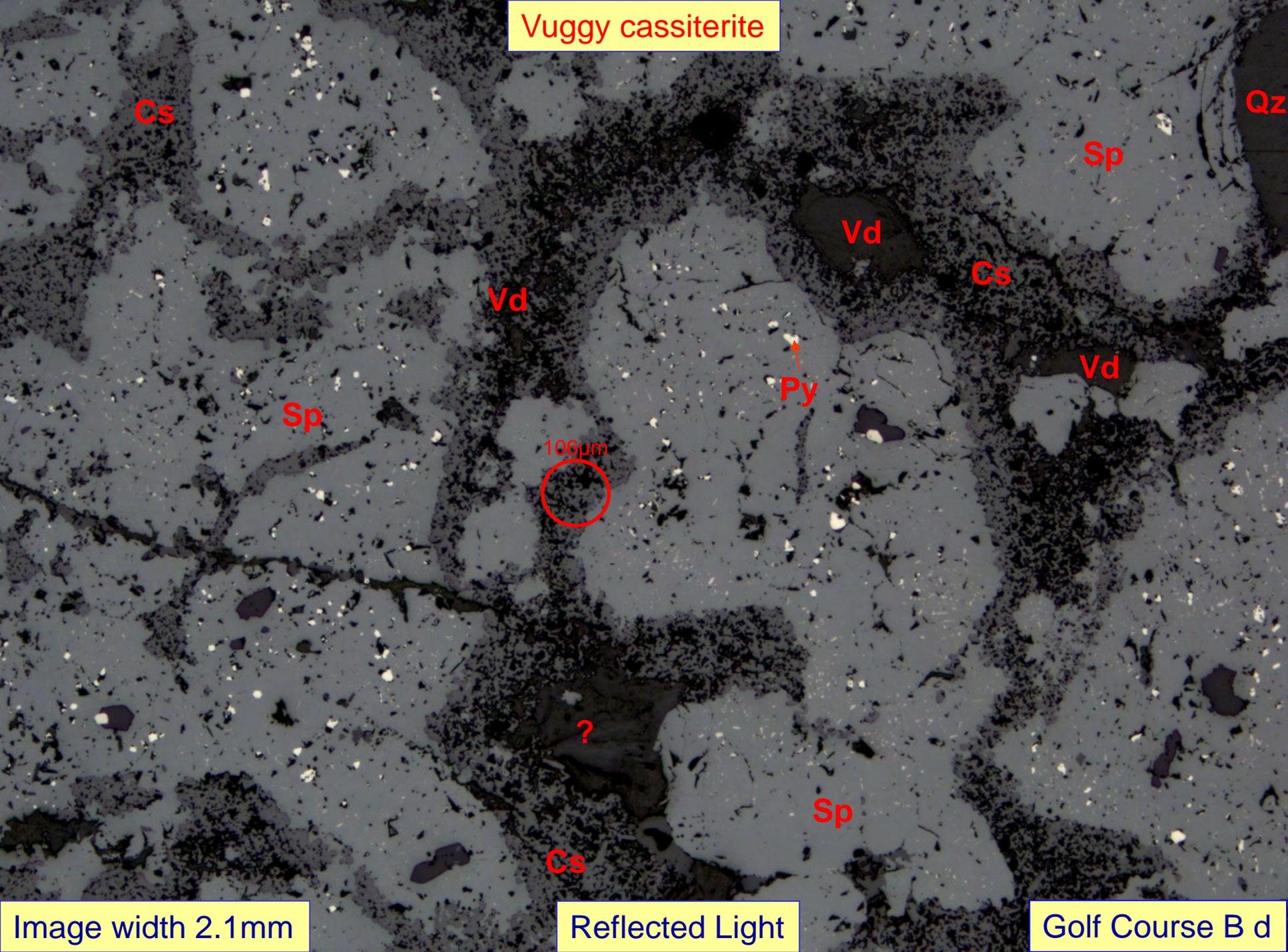


Image width 515µm

Reflected Light

Golf Course B c

Vuggy cassiterite



Cs

Qz

Sp

Vd

Cs

Vd

Vd

Sp

Py

100um

?

Sp

Cs

Image width 2.1mm

Reflected Light

Golf Course B d

Vuggy interstitial cassiterite

Cs

106µm



Cs

Sp

Cs

Vd

Sp

Cs

Cs

Sp

Py

Qz

Image width 2.1mm

Reflected Light

Golf Course B e

Quartz veinlet

Sp

Qz

Sp

Cs

106μm

Vd

Cs

Sp

Py

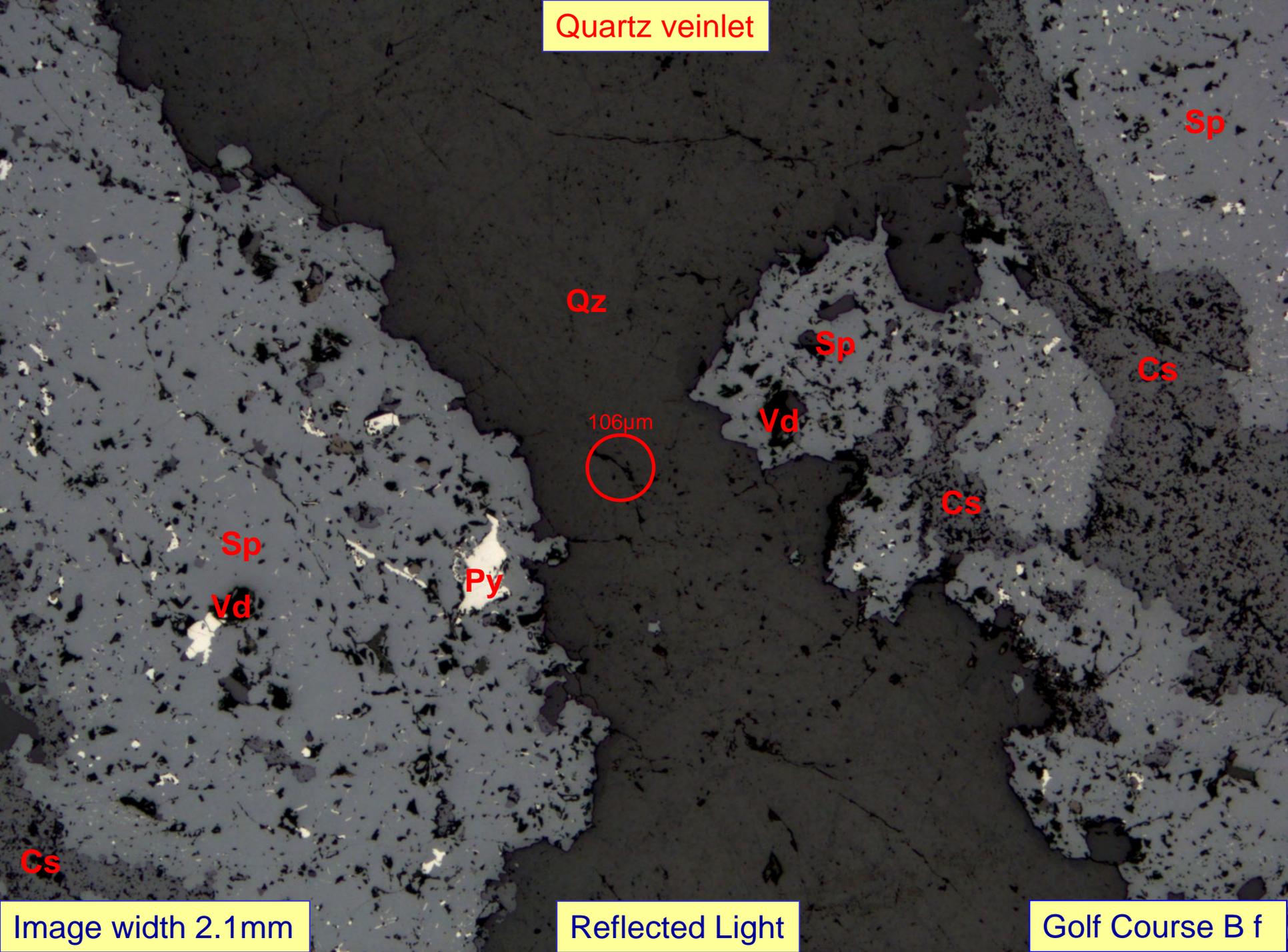
Vd

Cs

Image width 2.1mm

Reflected Light

Golf Course B f



Cassiterite-carbon interstitial to subhedral sphalerite

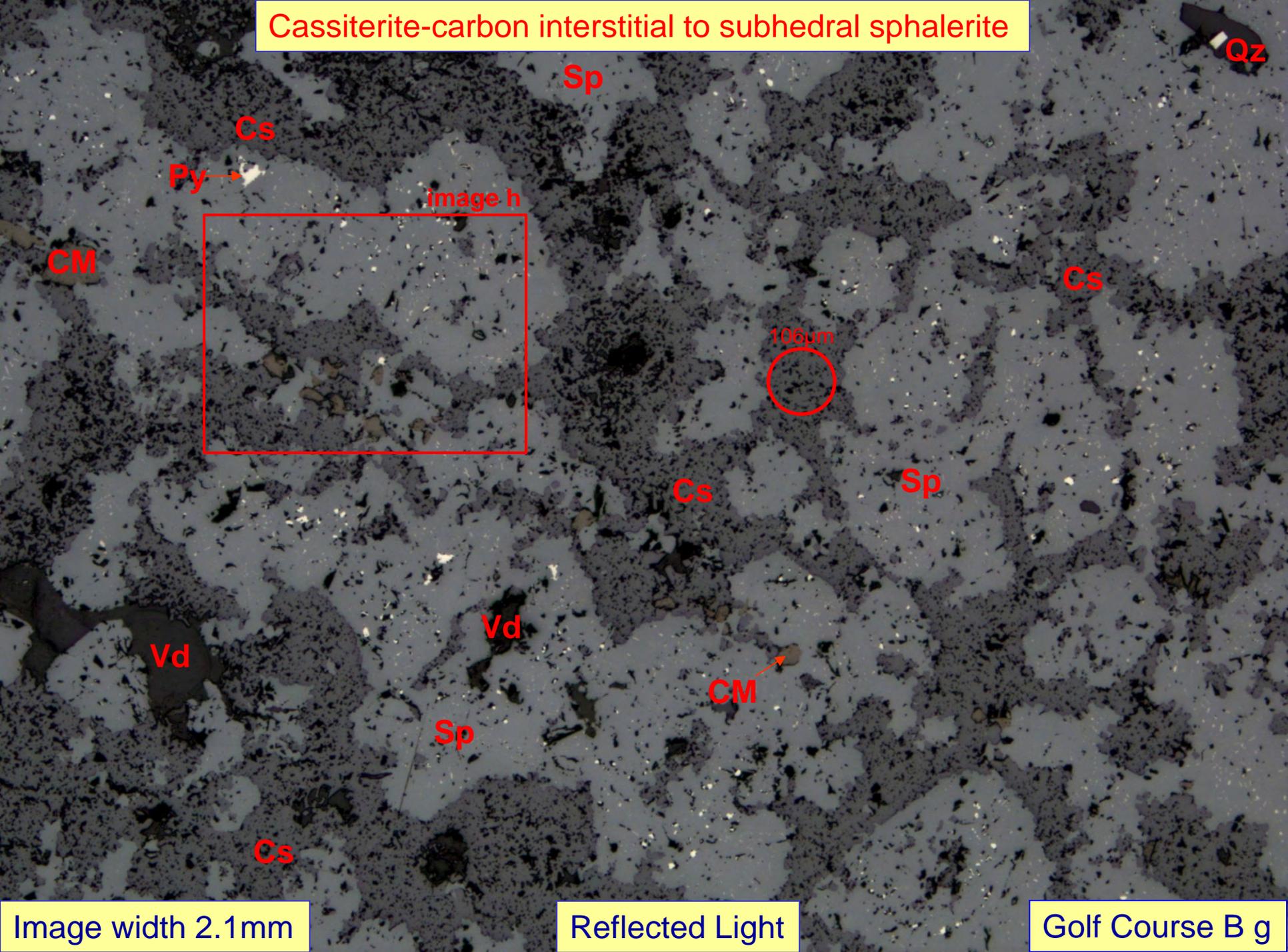
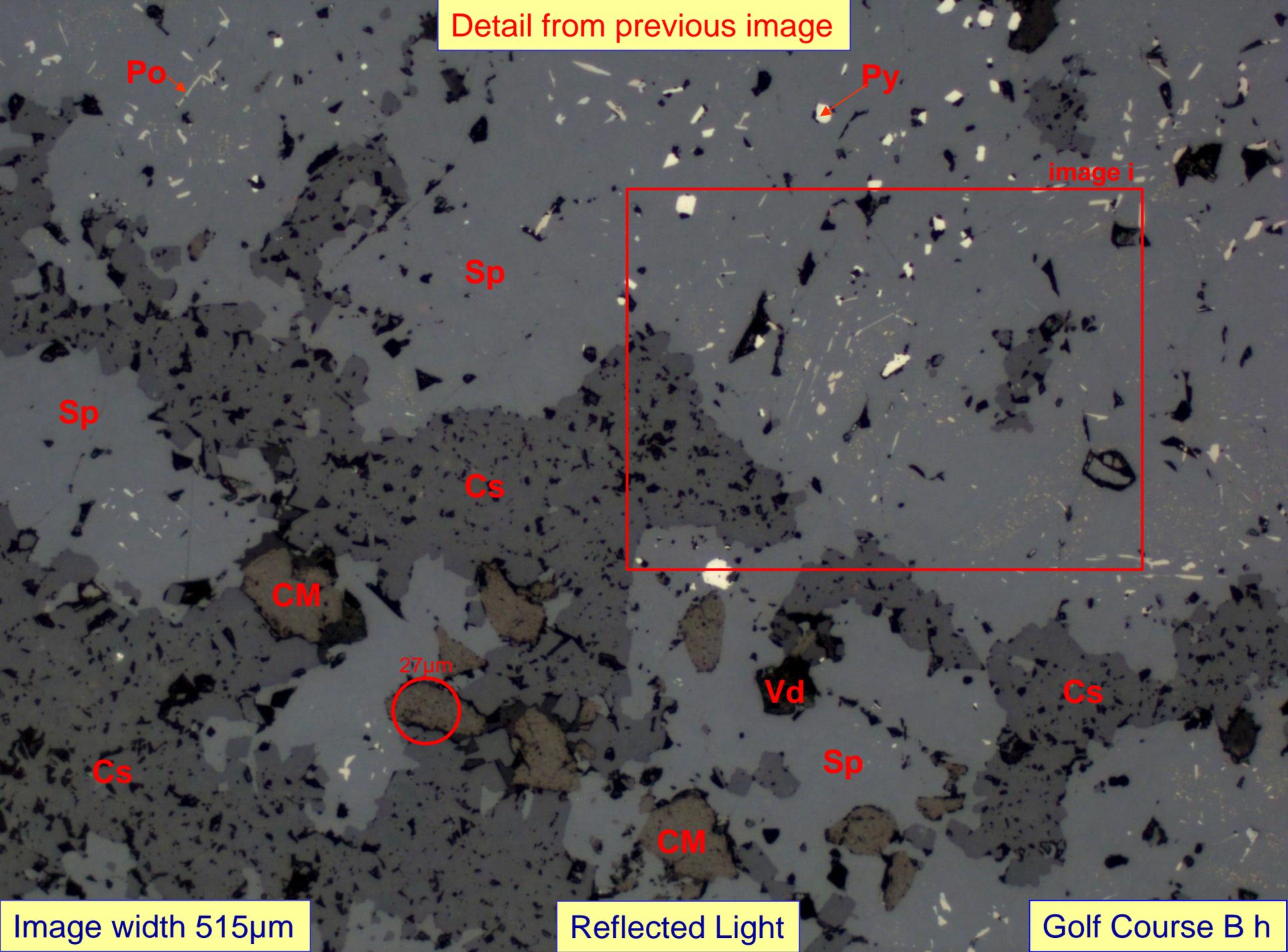


Image width 2.1mm

Reflected Light

Golf Course B g

Detail from previous image



Po

Py

image i

Sp

Sp

Cs

CM

27µm

Vd

Cs

Cs

Sp

CM

Image width 515µm

Reflected Light

Golf Course B h

Detail from previous slide

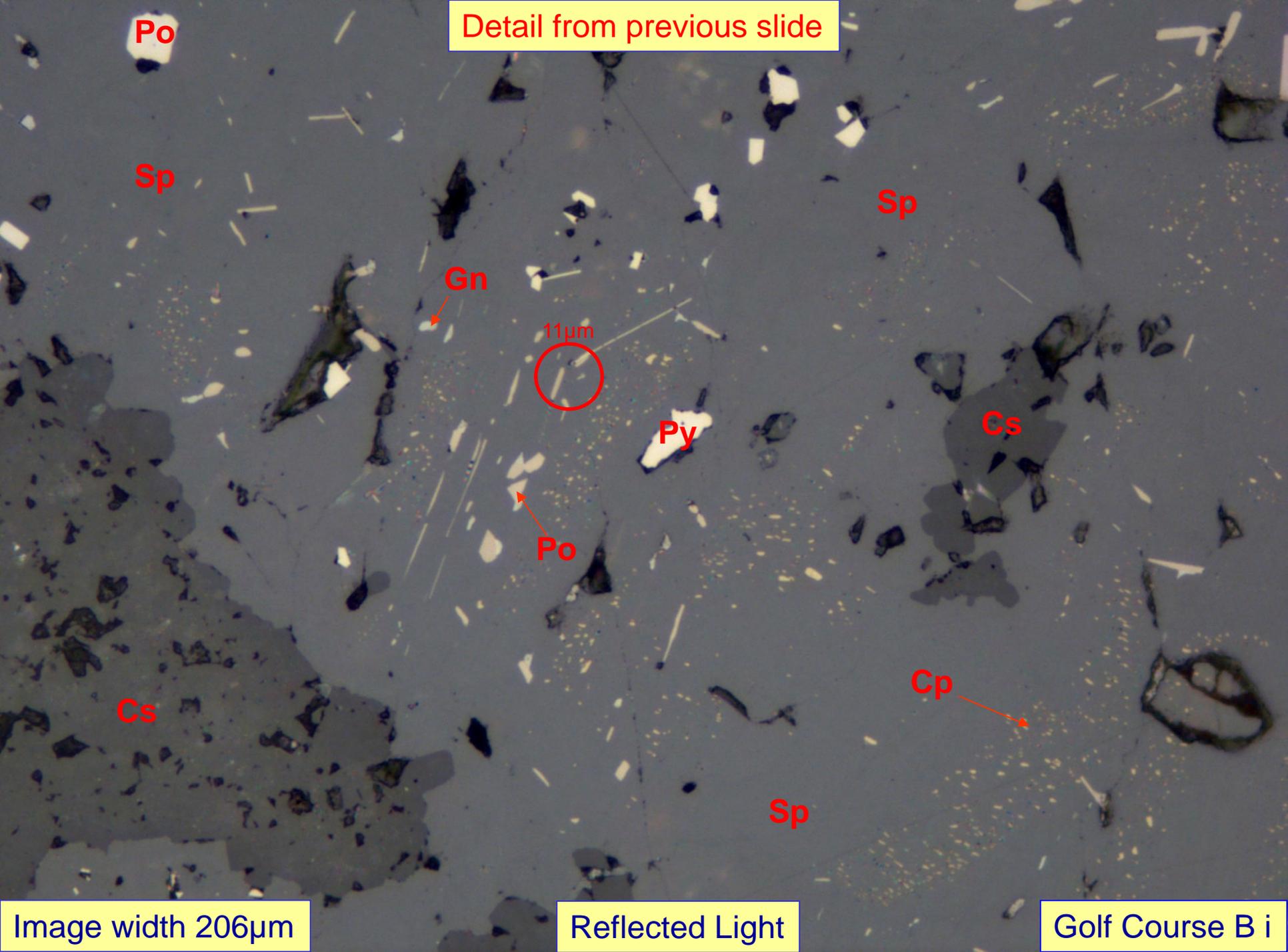
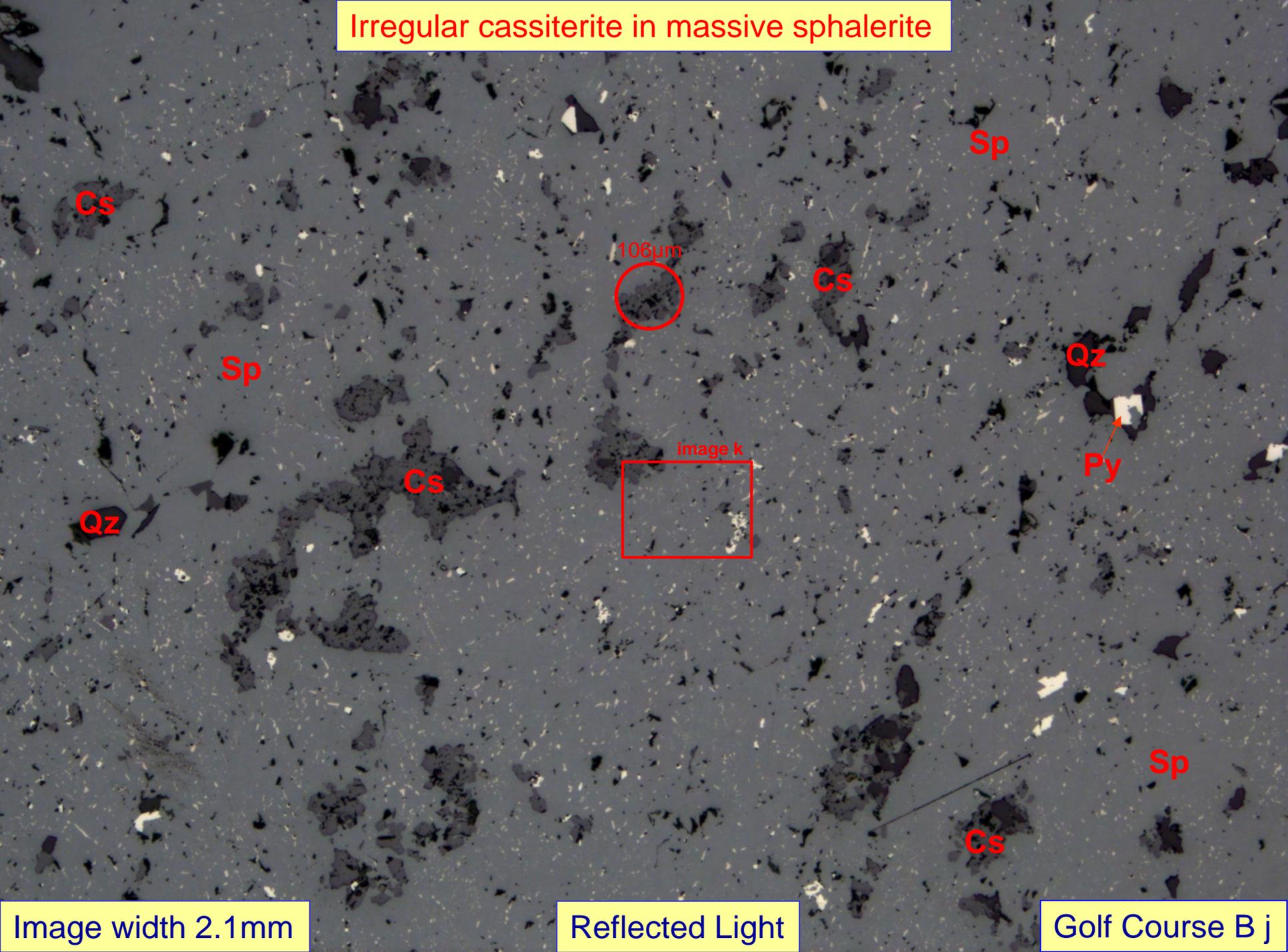


Image width 206µm

Reflected Light

Golf Course B i

Irregular cassiterite in massive sphalerite



Cs

Sp

106µm

Cs

Sp

Qz

image k

Py

Qz

Cs

Sp

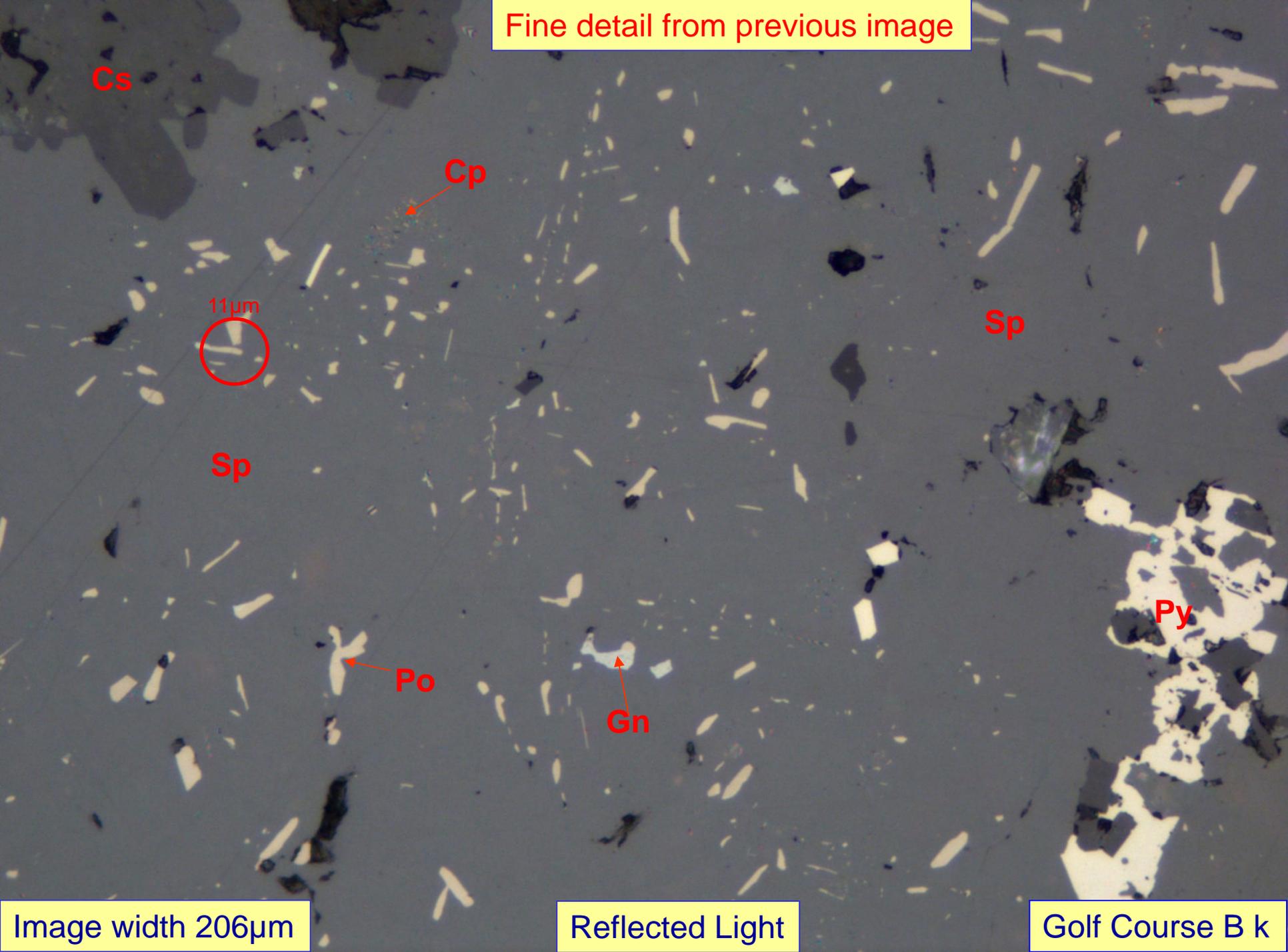
Cs

Image width 2.1mm

Reflected Light

Golf Course B j

Fine detail from previous image



Cs

Cp

11µm

Sp

Sp

Py

Po

Gn

Image width 206µm

Reflected Light

Golf Course B k

Galena replacing sphalerite

Gn

image m

Qz

Cs

Sp

Qz

Sp

Py

Gn

106µm

Cs/Co

Cs/Co

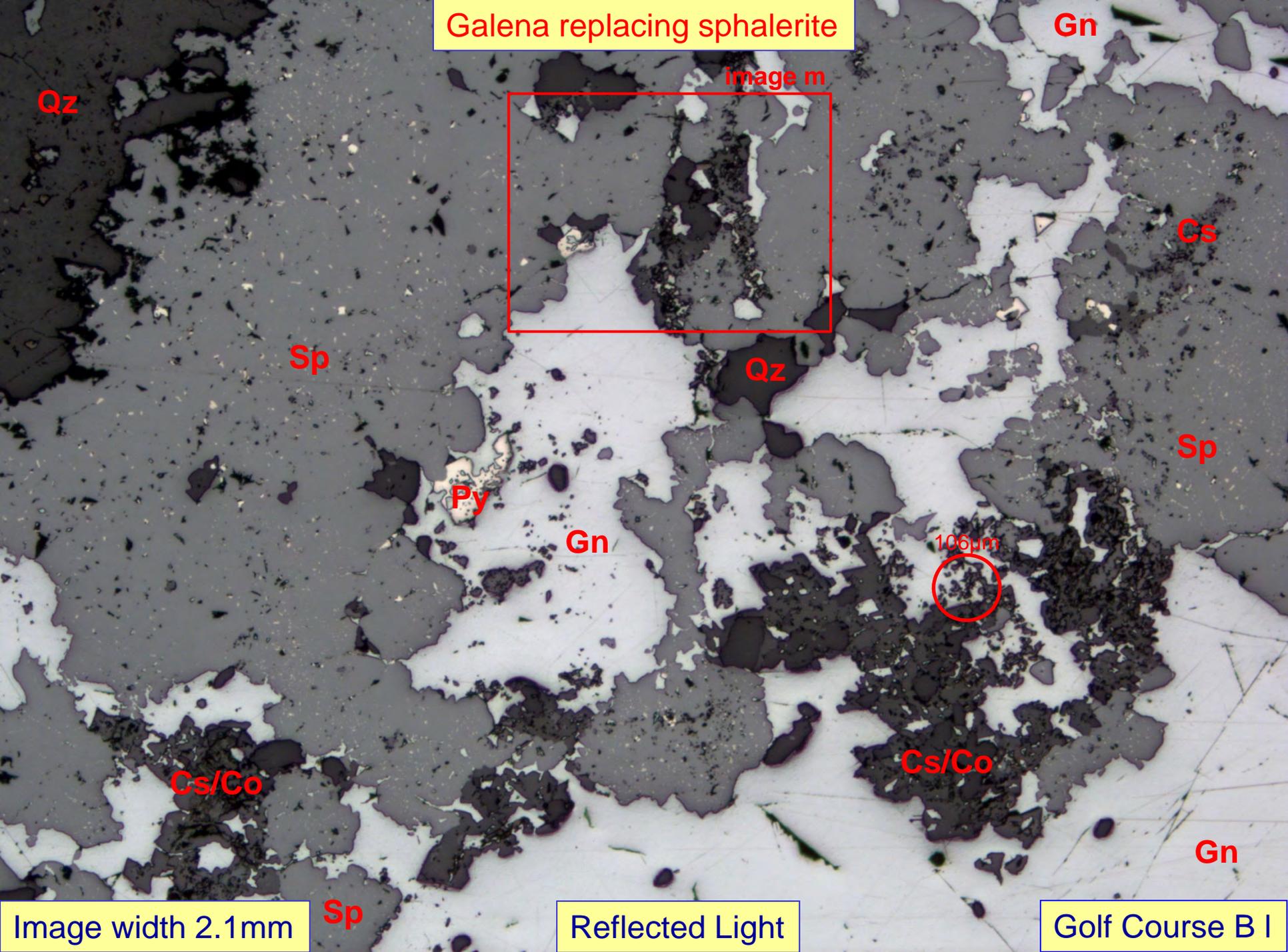
Gn

Sp

Reflected Light

Golf Course B I

Image width 2.1mm



Detail from previous image

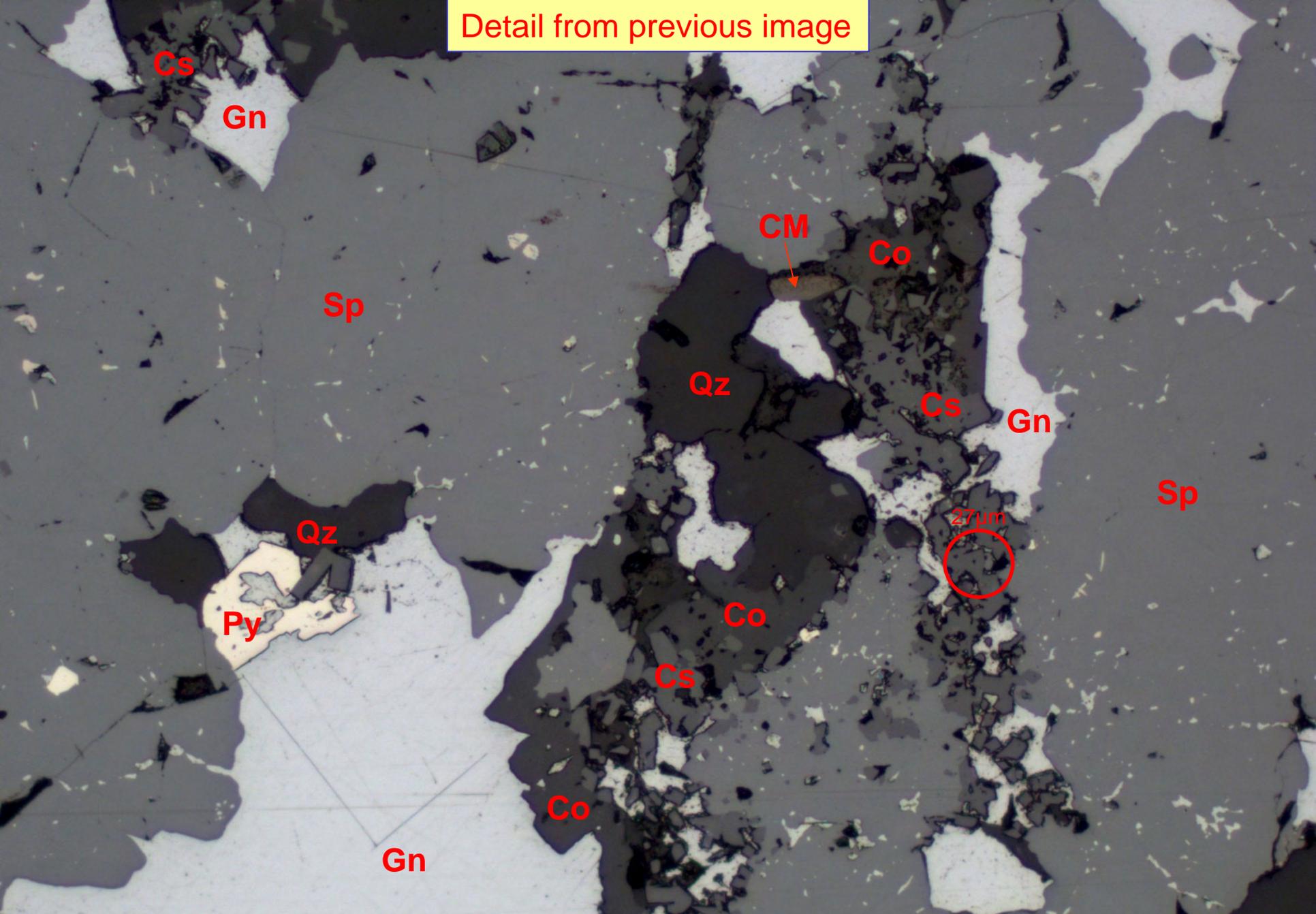


Image width 515µm

Reflected Light

Golf Course B m

Galena replacing sphalerite and interstitial to cassiterite

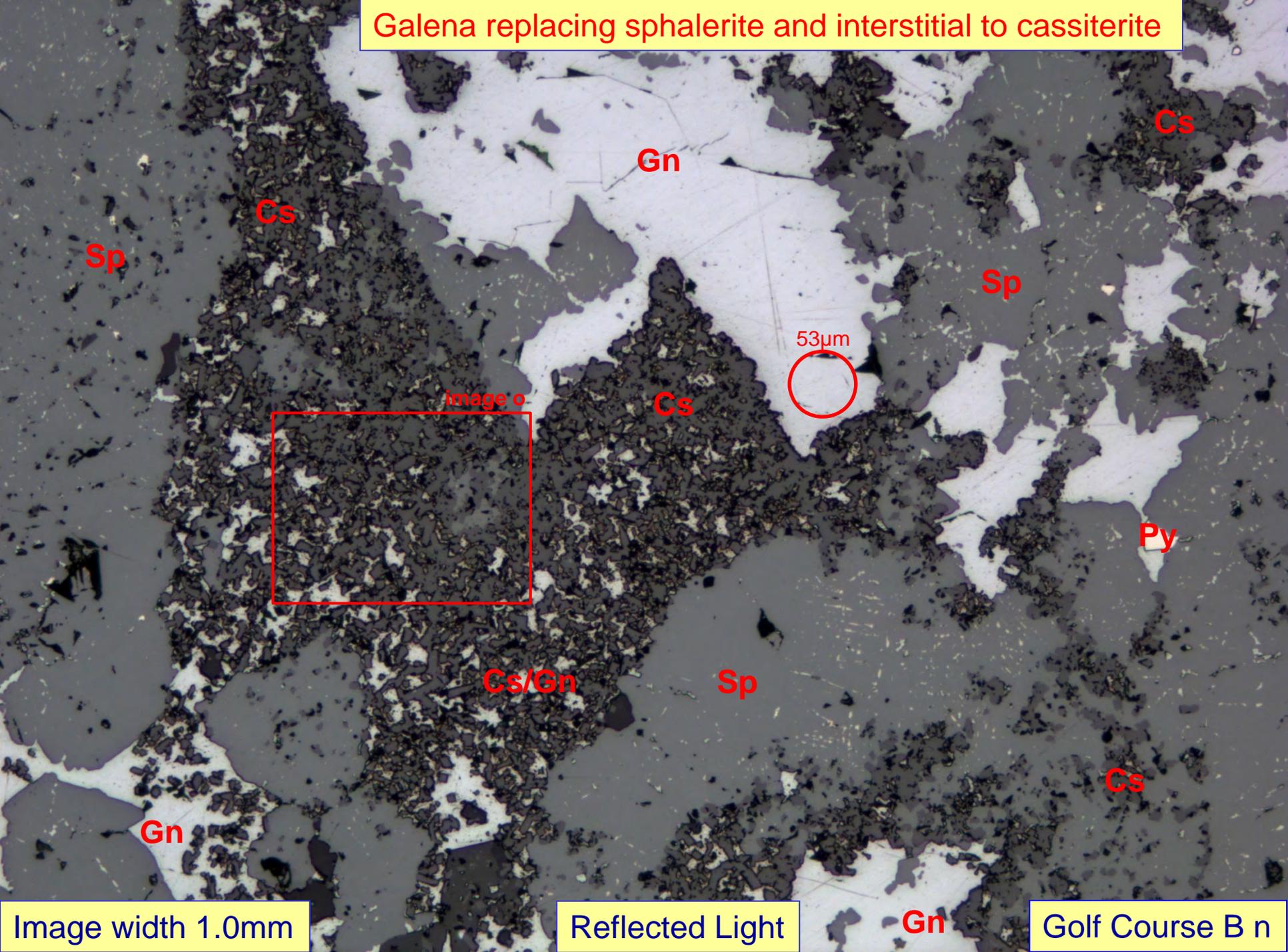
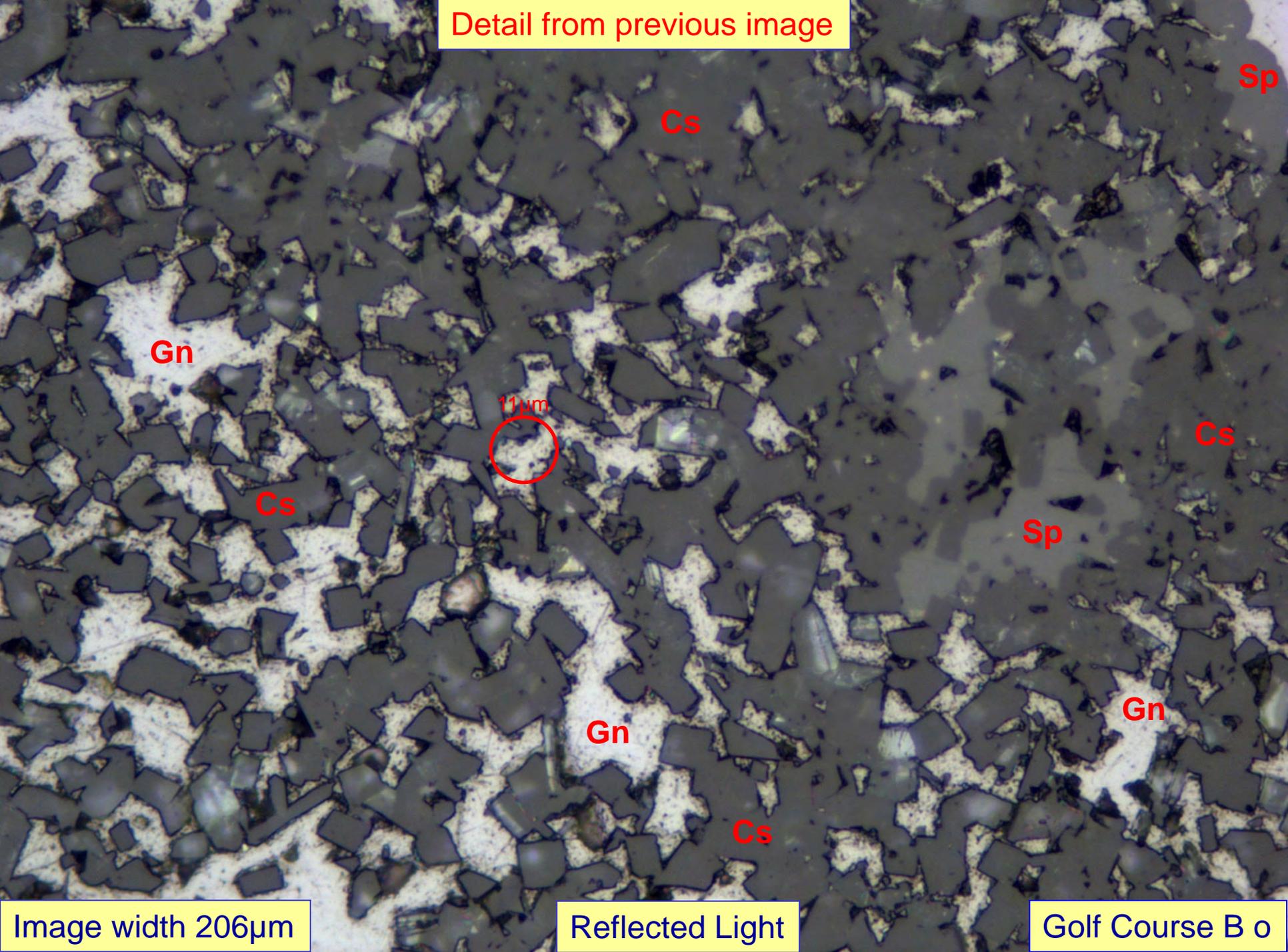


Image width 1.0mm

Reflected Light

Golf Course B n

Detail from previous image



Gn

Cs

Sp

11µm

Cs

Cs

Sp

Gn

Gn

Cs

Image width 206µm

Reflected Light

Golf Course B o

Unusual cassiterite rings

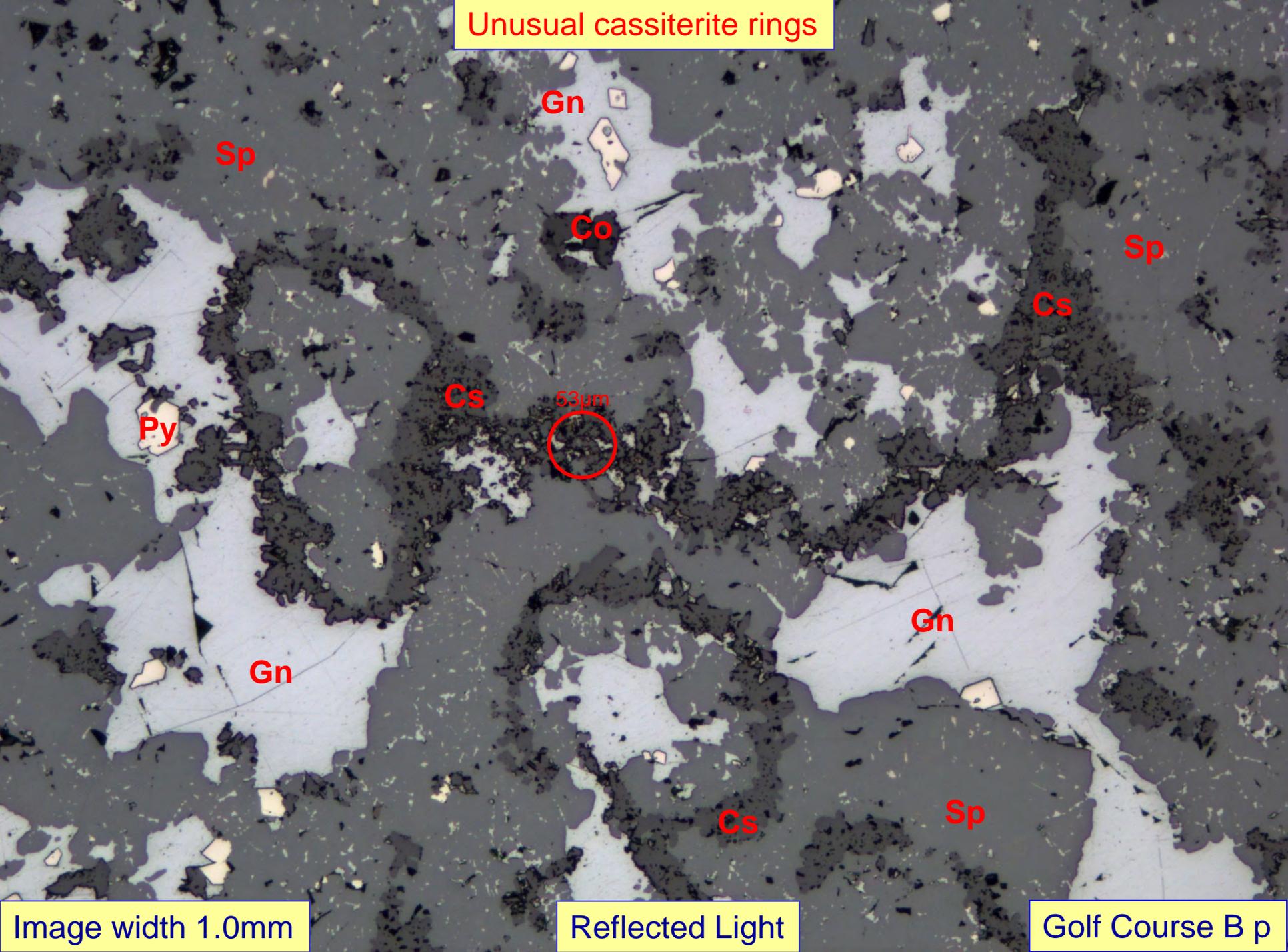


Image width 1.0mm

Reflected Light

Golf Course B p