Table 1: Visible + IR Flowchart

VIS-IR Step 1		
Does it satisfy all: PC1′ < -0.30 PC3′ ≥ 0.20 Slope ≥ 0.40	$\overset{no}{\rightarrow}$	VIS-IR Step 2
↓yes		
Does it satisfy: 0.55 ≤ Slope < 1.5	$\overset{yes}{\longrightarrow}$	A
↓no		
Does it satisfy: 0.40 ≤ Slope < 0.55	$\overset{yes}{\longrightarrow}$	Sa
↓**no**		
Indeterminate		

VIS-IR Step 2

Does it lie below line α?	$\xrightarrow{yes}$		VIS-IR Step 3	
$\downarrow$ no				
Does it line on or above line δ?	$\xrightarrow{yes}$	V	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Vw
$\downarrow$ no				
Does satisfy both: Lies on or below line η. Lies on or above θ and below δ	$\xrightarrow{yes}$	O ,Q		
$\downarrow$ no				
Does satisfy both: Lies on or below line η. Lies on or above α and below θ.	$\xrightarrow{yes}$	Q	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Qw
$\downarrow$ no				
Does satisfy both: Lies on above line η. Lies on or above γ and below δ	$\xrightarrow{yes}$	R		
$\downarrow$ **no**				
VIS-IR S-Complex				

VIS-IR Step 3

Does it satisfy both: $0.38 \leq$ Slope < 1.5 $-0.44 <$ PC1$' < 0.4$	$\xrightarrow{yes}$	D	A: Prominent 1-μm feature
$\downarrow$ no			
Does it satisfy all: $0.25 <$ Slope < 0.38 $-0.28 <$ PC2$' < -0.20$ $-0.20 <$ PC3$' < -0.12$	$\xrightarrow{yes}$	T	
$\downarrow$ no			
Does it satisfy both: $0.07 <$ PC1$' < 1.00$ $-0.5 <$ PC2$' < -0.15$	$\xrightarrow{yes}$	L, Xe	Xe: Shows feature at 0.49μm.
$\downarrow$ no			
Does it satisfy all: $-0.075 <$ PC3$' < 0.14$ $-0.20 \leq$ PC2$' < -0.10$ $-0.80 <$ PC1$' < -0.10$	$\xrightarrow{yes}$	K, Xe	Xe: Shows feature at 0.49μm.
$\downarrow$ **no**			
VIS-IR C- and X-Complexes			

VIS-IR S-Complex

Does it satisfy both: Lies below β and above ζ	$\xrightarrow{yes}$	S	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Sw
$\downarrow$ no				
Does it satisfy all: Lies on or above α and below β Lies above η and on or below ζ	$\xrightarrow{yes}$	Sq	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Sqw
$\downarrow$ no				
Does it satisfy all: Lies on or above β and below γ Lies above η and on or below ε	$\xrightarrow{yes}$	Sr	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Srw
$\downarrow$ no				
Does it satisfy all: Lies on or above β Lies above ε and below γ	$\xrightarrow{yes}$	Sv	$\xrightarrow{and\ if\ Slope \geq 0.25}$	Add w notation Svw
$\downarrow$ **no**				
Indeterminate				

VIS-IR C- and X-complexes

Does it satisfy all: -0.2 < Slope < 0 -1.2 < PC1′ < 0 ~~PC4′ < 0~~	*yes* ⟶	B	
↓ no			
Does it satisfy: 0.2 < Slope < 0.38	*yes* ⟶	X, Xk, Xe, C, Xn	X: Featureless Xk: Shows feature between 0.8 - 1 μm. Xe: Shows feature at 0.49 μm. C: Shows feature between 1 - 1.3 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy all: 0.01 < PC4′ < 0.14 -0.75 < PC1′ < -0.27 Reflectance at 0.45 μm < 0.92.	*yes* ⟶	Cgh,Xk, Xn	Cgh: Shows feature at 0.7 μm. Xk: Shows feature between 0.8 - 1 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy both: 0.01 < PC4′ < 0.14 -0.75 < PC1′ < -0.27	*yes* ⟶	Ch, Xk, Xn	Ch: Shows Shows feature at 0.7 μm. Xk: Shows feature between 0.8 - 1 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy both: -0.04 < PC4′ < 0.02 -0.07 < PC5′ < -0.04	*yes* ⟶	Cb	
↓ no			
Does it satisfy both: -1.0 < PC1′ < -0.45 -0.08 < PC5′ < 0.02	*yes* ⟶	C, Ch, Xk, Xn	C: Shows feature between 1 - 1.3 μm. Ch: Shows feature at 0.7 μm. Xk: Shows feature between 0.8 - 1 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy both: 0.02 ≤ PC5′ < 0.1 -0.60 < PC1′ < -0.16	*yes* ⟶	Cgh, Cg, Xk, Xn	Cgh: Shows feature at 0.7 μm. Xk: Shows feature between 0.8 - 1 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy both: -0.45 ≤ PC1′ < 0.1 -0.06 < PC5′ < 0.05	*yes* ⟶	Xk, Xc, Xe,C, Ch, Xn	Xk: Shows feature between 0.8 - 1 μm. Xc: Featureless. Xe: Shows feature at 0.49 μm. C: Shows feature between 1 - 1.3 μm. Ch: Shows Shows feature at 0.7 μm. Xn: Show Nysa-like feature at 0.9 μm.
↓ no			
Does it satisfy both: -0.1 ≤ PC1′ < 0.3 -0.5 < PC2′ < -0.2	*yes* ⟶	Xe, L	Xe: Shows feature at 0.49 μm.
↓ no			
Indeterminate			

VIS-IR Checks[1] for Cg, Cgh, Ch, Xc, Xe, Xk		VIS-IR Equations	
Cg	Strong UV absorption feature before 0.55 μm	$PC1' = -3PC2' - 0.28$	Line α
Ch	Moderately shallow absorption feature around 0.7 μm	$PC1' = -3PC2' + 0.35$	Line β
Cgh	Strong UV absorption feature like Cg and 0.7-μm	$PC1' = -3PC2' + 1.00$	Line γ
	feature like Ch (Reflectance at 0.45 μm < 0.92)	$PC1' = -3PC2' + 1.50$	Line δ
Xc	Red and featureless with slight concave down curvature	$PC1' = \frac{1}{3}PC2' + 0.50$	Line ε
Xe	Concave-up absorption feature before 0.55 μm	$PC1' = \frac{1}{3}PC2' - 0.10$	Line ζ
Xk	Red shortward of 0.75 μm and generally flat	$PC1' = \frac{1}{3}PC2' - 0.50$	Line η
	longward of 0.75 μm	$PC1' = -3PC2' + 0.70$	Line θ
Xn	Weak, narrow, Nysa-like feature at 0.9 μm		

[1]These spectral features are originally defined in Bus (1999) and Table 2 of Bus and Binzel (2002).

Table 2: IR Flowchart

IR Step 1: End Members

Does it satisfy: $PCir1' \geq 0.5$	$\xrightarrow{yes}$	V
$\downarrow$ no		
Does it satisfy all: $0.29 \leq PCir1' < 0.5$ $PCir5' \leq 0.05$	$\xrightarrow{yes}$	Sv, Sr
$\downarrow$ no		
Does it satisfy all: $PCir2' \leq -0.5$ $PCir4' \geq 0.15$ $-0.40 < PCir1' \leq 0$	$\xrightarrow{yes}$	O
$\downarrow$ no		
Does it satisfy all: $0.25 \leq PCir2' < 0.5$ $PCir5' \geq 0.06$ $PCir3' \geq 0.05$	$\xrightarrow{yes}$	R
$\downarrow$ no		
Does it satisfy all: Below line 1 ~~$PCir3' \leq -0.02$~~ $Slope_{ir} \geq 0.24$	$\xrightarrow{yes}$	D
$\downarrow$ no		
Does it satisfy all: $PCir1' \leq -0.4$ $PCir2' \leq -0.2$ $PCir4' \geq -0.07$ $Slope_{ir} \geq 0.5$ $PCir3' \geq 0$	$\xrightarrow{yes}$	A
$\downarrow$ no		
Does it satisfy all: $PCir1' \leq -0.4$	$\xrightarrow{yes}$	Sa
$\downarrow$ **no**		
Step 2		

IR Step 2: S-complex

Does it lie on or above line 1 and 2?	*yes* $\longrightarrow$	S, Sr, Sq, Q
$\downarrow$ no		
Does it lie on or above line 1 and between line 2 and 3?	*yes* $\longrightarrow$	S, Sq, Q, L, K
$\downarrow$ no		
Does it line on or above line 1 and on or between line 3 and 4?	*yes* $\longrightarrow$	K, L, Sq
$\downarrow$ **no**		
IR Step 3		

IR Step 3: C- and X-complexes

Does it satisfy: Below line 1 and on or between 3 and 4?	*yes* $\longrightarrow$	X-, C-complexes, L, K, T
$\downarrow$ no		
Does it satisfy: Below line 1 and between 2 and 3?	*yes* $\longrightarrow$	X-, C-complexes
$\downarrow$ no		
Does it satisfy: Below line 1 and 4?	*yes* $\longrightarrow$	C, B, L, Cb, X
$\downarrow$ **no**		
Indeterminate		

IR Equations

PCir3′ =PCir2′ - 0.08	Line 1
PCir1′ =PCir2′ + 0.15	Line 2
PCir1′ =PCir2′ - 0.10	Line 3
PCir1′ =PCir2′ - 0.40	Line 4