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F-Block

Last e^- of these elements entered in $(n-2)f$ Sub sheel

So they are also called inner transition element

Sc Ti ---- Zn

Y Zr Cd

57 La 72 Hf Hg

89 Ac 104 Ku/Rf

Ce (58) — La (57) 4f series | Lanthanides

Th (90) — Lr (103) 5f series | Actinides

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Lanthanides

La = last e⁻ 4f → 5d¹

Ac = last e⁻ 5f → 6d¹

d-block element

f Subshell not regularly fill but in tripositive ion regularly filling

			tripositive ion
Ce	सिर	$4f^1 5d^1 6s^2$	$4f^1$
Pr	पर लेकर	$4f^3 6s^2$	$4f^2$
Nd	नौ दिये	$4f^4 6s^2$	$4f^3$
Pm	परमेश्वरी	$4f^5 6s^2$	$4f^4$
Sm	समझाये	$4f^6 6s^2$	$4f^5$
Eu	यो	$4f^7 6s^2$	$4f^6$
Gd	गढ़	$4f^7 5d^1 6s^2$	$4f^7$
Tb	तब	$4f^9 6s^2$	$4f^8$
Dy	दियो	$4f^{10} 6s^2$	$4f^9$
Ho	हो	$4f^{11} 6s^2$	$4f^{10}$
Er	इर	$4f^{12} 6s^2$	$4f^{11}$
Tm	तुम	$4f^{13} 6s^2$	$4f^{12}$
Yb	इब	$4f^{14} 6s^2$	$4f^{13}$
Lu	लुटवाये	$4f^{14} 5d^1 6s^2$	$4f^{14}$

Oxidation state

Stable oxidation state = +3

Tb^{+4} (O.A) = $4f^7$ (Half filled)

+2 (R.A) ⟶ +3 ⟵ +4 (O.A)

Ce^{+4} → due to Noble gas conf.

(O.A)

$Ce^{+4} \mid Ce^{+3} = 1.74$

$\Delta G = -nFE^0$

It good oxidising and it oxidise water and use for analytic chemistry

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$Eu^{+2} = 4f^7 \rightarrow (R.A)$

$Yb^{+2} = 4f^{14} \rightarrow (R.A)$

(R.A)

Magnetic prop. → paramag behavior ↑ up ↗ [Gd]

after this paramag nature ↓

Nd — highest paramag.

★ Ce^{+4} f^0 La^{+2} f^{14} ⇒ Dia

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only Pm is Synthetic radioactive

Physical prop:

1. They are white silvery metal, their metallic surface rapidly turnish on air
2. They m.p ↓, range 1000 – 1200 K
   Sm m.p is 1623 K
3. they are soft but sm being steel Hard.
4. their Hardness increses with atomic number
5. alloy of Lanthanide is called mischmetal
   Lanthide [95%] Fe(5%) and
   Ca | S | C | Al (traces)

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(5) I.E → I I.E of lanthanides is 600 KJ/mole and II I.E is 1200 KJ/mole and it is Comparable with Ca

order of size

→ $Sm^{+3} > Eu^{+3} > Tb^{+3}$

basic order $La(OH)_3 > Lu(OH)_3$

Ce → Lu [acidic ch. ↑]

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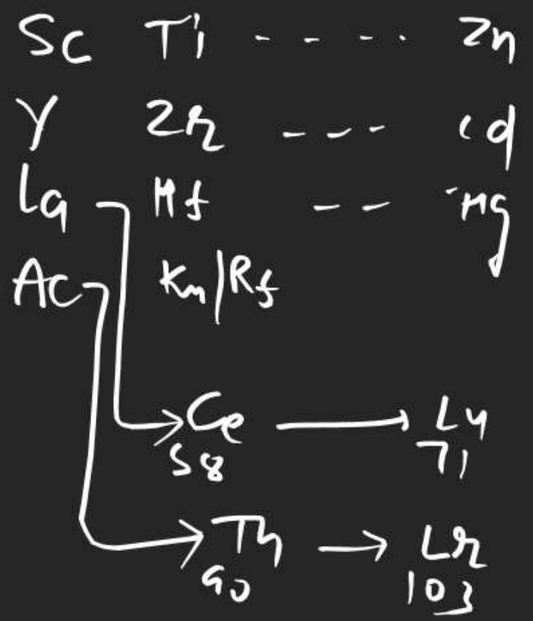
Lanthanide contraction



$3d < 4d \approx 5d$

due to lanthanide contraction due to poor SE of 4f subshell

$Ti < Zr \simeq Hf$

160 pm 159 pm

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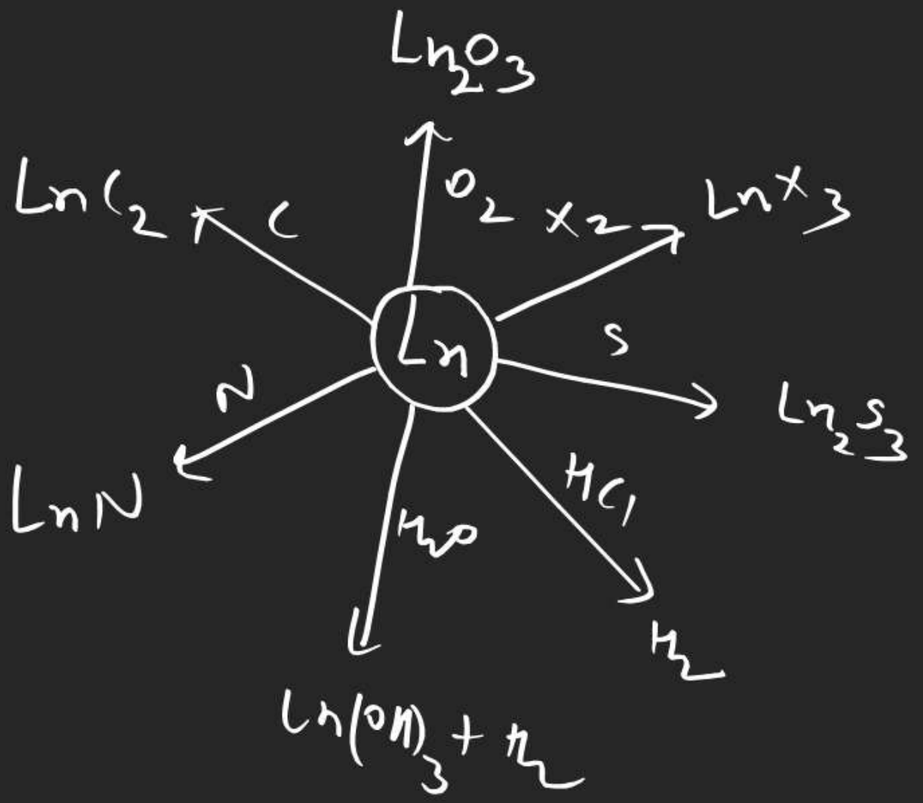
Chemical prop.



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actinides

AC ऐ

Th था
Pa पा
U यू
NP नेपाली
Pu पूरे
Am अमेरिकन
Cm से मिलते हो
BK बेक
Cf फूफ
Es ऐसा
Fm फिल्मी
Md मूड
No ना
Lr लाओ

$_{90}Th$ $_{91}Pa$ $_{92}U$ ⇒ Natural Radio active element

$_{93}NP \rightarrow {}_{103}Lr$ = Synthetic Radio active

all actinides are radio active

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Stable O.S = +3

and it is more stable than Lanthanide

highest oxidation state is +7 Np, Pu
but it unstable

highest Stable Oxidation state +6 U

Actinide Contraction

due to poor S.E of 5f Subshell
and it is greater than the Lanthanide
Contraction. due to diffuse shape of 5f

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Colour →

f^1 to f^{13} Colorful

f^0 and f^{14} Colourless

f^n and f^{14-n} = Same Colour