Catalog # 72-0751 Hafnium(IV) chloride, sublimed grade (99.9+%-Hf, <1.0% Zr)

$HfCl_4$

Thermal Behavior:

- Sublimation at 320°C
- Melting point: 432°C (Triple point; sealed tube)
- Vapor pressure 1 Torr at 190°C; Tables are available in [1]

Technical Notes:

1. ALD/CVD precursor for hafnium thin film deposition

Target Deposit	Deposition Technique	Delivery Temperature	Pressure	Co-reactants	Deposition Temperature	Ref.
HfO_2	ALD ALD ALD ALD AP-ALD ALD	200°C - 140°C 170°C 160°C 165-190°C	1.5 Torr 2-6 Torr - - AP 1 Torr	H_2O H_2O H_2O H_2O O_2 O_3	300°C 200-300°C 180°C 250°C 300°C 200-250°C	2 3 4 5 6 7
HfS_2	CVD ALD	300°C 125-130°C	- 3.75 Torr	S^{Powder} H_2S	950°C 400°C	8 9
$Hf_xAl_yO_z$	ALD	-	7.5 Torr	$Al(OEt)_3$	400°C	10
$Hf_xAl_yC_z$	ALD	160°C	-	TME	270°C	11
$Hf_xSi_yO_z$	ALD	180°C	-	$Si(OC_2H_4)_4$; H_2O	300°C, 500°C	12
$Hf_xCa_yO_z$	ALD	160°C	-	$Ca(Cp^{3i})_2$; H_2O	300°C	13
$Hf_xTi_yO_z$	ALD	170°C	4 Torr	$TiCl_4$; H_2O	300°C	14
$Hf_xY_yO_z$	ALD	-	0.5 Torr	$Y(Cp^*)_3$; H_2O	260-420°C	15
$Gd:HfO_2$	ALD	-	-	$Gd(^iPrCp)_3$; H_2O	300°C	16
$Pr:HfO_2$	ALD	-	1.5 Torr	$Pr(THMD)_3$; O_3	250-350°C	17

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