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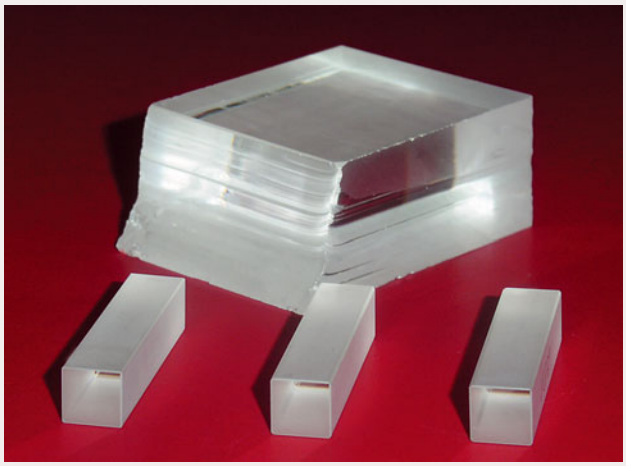
Crystals for Stimulated Raman Scattering



EKSPLA offers crystalline materials – **Barium Nitrate – $Ba(NO_3)_2$** and **undoped potassium gadolinium tungstate $KGd(WO_4)_2$** or KGW which have attracted much interest as most suitable crystals for stimulated Raman scattering (SRS). These materials can be used for frequency conversion in lasers for extending of tuning range. SRS in crystals is compatible with current all-solid-state technology and provides a very simple, compact means of frequency conversion.

$Ba(NO_3)_2$ has a highest Raman gain coefficient. The gain coefficient affects the threshold for Raman laser. However the thermal lensing is particularly strong in this material. This is indicated by the large value $\delta n/\delta T$ and low thermal conductivity. Thermal effects are significantly smaller in KGW. This along with the high damage threshold make the crystal an excellent candidate for power scaling.

KGW PHYSICAL AND OPTICAL PROPERTIES

Crystal symmetry	monoclinic, C2/c
Transmission range	0.35–5.5 μm
Density	7.27 g/cm^3
Hardness Mohs	4-5
Refractive indices @ 1064 nm	n_g = 2.061; n_m = 2.010; n_p = 1.982
Raman shift	901 cm^{-1} (p[mm]p) 768 cm^{-1} (p[gg]p)
Raman gain, pump 1064 nm	3.3 cm/GW (901 cm^{-1}) 4.4 cm/GW (768 cm^{-1})
Thermal conductivity, W/mK	Ka=2.6; Kb=3.8; Kc=3.4
$\delta n/\delta T$	0.4 × 10^{-6} K^{-1}
Optical Damage Threshold	> 10 GW/cm^2

$Ba(NO_3)_2$ PHYSICAL AND OPTICAL PROPERTIES

Crystal symmetry	cubic, P2$_1$3
Transmission range	0.35–1.8 μm
Density	3.25 g/cm^3
Hardness Mohs	2.5–3
Refractive indices @ 1064 nm	n = 1.555
Raman shift	1048 cm^{-1}
Raman gain, pump 1064 nm	11 cm/GW
Thermal conductivity, W/mK	1.17
$\delta n/\delta T$	-20 × 10^{-6} K^{-1}
Optical Damage Threshold	~ 0.4 GW/cm^2

PREPARATION OF FINISHED ELEMENTS

	$Ba(NO_3)_2$	KGW
Surface quality, scr/dig	40/20	10/5
Flatness @ 633 nm	λ/4	λ/8
Maximal element dimensions, mm	10×10×100	10×10×80

Comparing $Ba(NO_3)_2$ and KGW for Raman application $Ba(NO_3)_2$ are more effective in case of ns pulses and KGW – in case of ps pulses.

Stokes generation wavelengths in KGW crystal with oscillation efficient 901.5 cm^{-1} and $Ba(NO_3)_2$ crystal with oscillation coefficient 1048.6 cm^{-1} are given in the table below.

Stokes	KGW pumped @ 532 nm	KGW pumped @ 1064 nm	$Ba(NO_3)_2$ pumped @ 532 nm	$Ba(NO_3)_2$ pumped @ 1064 nm	Efficiency, %
1 Stoke	558	1177	563	1197	35–70
2 Stoke	588	1316	598	1369	20–40
3 Stoke	621	1494	638	1599	10–15
4 Stoke	658	1726	684	1924	<10
1 Antistoke	507	970	503	957	10–30

EKSPLA distributor in **United Kingdom**

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Please contact EKSPLA for further information or nonstandard specifications.

Nonlinear and Laser Crystals