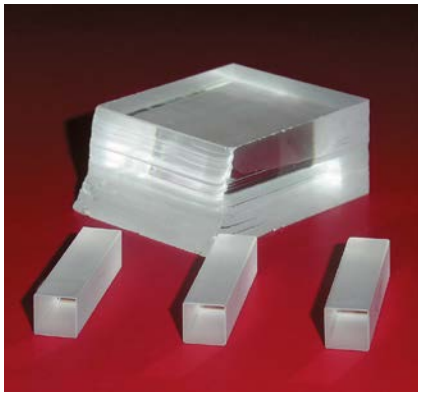
Raman Crystals

KGW / $Ba(NO_3)_2$ – CRYSTALS FOR STIMULATED RAMAN SCATTERING



EKSMA OPTICS 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 for stimulated Raman scattering (SRS). These materials can be used for frequency conversion in lasers for extending the 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 ∂n/∂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.

Comparing $Ba(NO_3)_2$ and KGW for Raman application $Ba(NO_3)_2$ is more optimal in case of ns and longer pulses, KGW – in case of shorter pulses.

$Ba(NO_3)_2$ PHYSICAL AND OPTICAL PROPERTIES

Crystal symmetry	cubic, $P2_13$
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
∂n/∂T	-20×10^{-6} K^{-1}
Optical Damage Threshold	~ 0.4 GW/cm^2

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	K_a=2.6; K_b=3.8; K_c=3.4
∂n/∂T	0.4 × 10^{-6} K^{-1}
Optical Damage Threshold	> 10 GW/cm^2

RAMAN WAVELENGTHS
in KGW (oscillation coefficient 901.5 cm^{-1}) and $Ba(NO_3)_2$ (oscillation coefficient 1048.6 cm^{-1}) crystals

Stokes	KGW pumped @ 532 nm	KGW pumped @ 1064 nm	$Ba(NO_3)_2$ pumped @ 532 nm	$Ba(NO_3)_2$ pumped @ 1064 nm	Typical 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

STANDARD SPECIFICATIONS

	$Ba(NO_3)_2$	KGW
Surface Quality, scratch & dig (MIL-PRF-13830B)	40-20	10-5
Flatness @ 633 nm	λ/4	λ/8
Maximal element dimensions, mm	10×10×100	10×10×80

STANDARD KGW CRYSTALS. Updoped, b-cut

Dimensions, mm	Coating	Catalogue number	Price, EUR
7 × 7 × 30	Uncoated	KGW-701	600
5 × 7.5 × 30	BBAR/BBAR @ 400 – 700 nm	KGW-702	785