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CONTRACT CRYSTAL GROWTH AND FABRICATION SERVICES

Quarterly Technical Report # 4

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SUMMARY

This program is intended to give the scientists at the Naval Research Laboratory the ability to evaluate new solid state laser crystals. During the fourth quarter of this contract only one growth run was performed and three parts were fabricated from this crystal.

CRYSTAL GROWTH

The crystal requested and grown was Cr,Tm:YALO. The melt composition is listed in Table 1. It was assumed that the distribution coefficients are unity and that the crystal composition will be the same as the melt.

TABLE 1: Composition

Growth Run	Melt composition	Nominal Doping at% (cm^{-3})
NRL-9	$Y_{0.958}Tm_{0.042}Al_{0.996}Cr_{0.004}O_3$	4.2 % Tm ($8.2x10^{20}$) 0.4 % Cr ($7.8x10^{19}$)

The growth conditions are listed in Table 2. The crystal was grown with a b-axis YALO seed. At about the time full diameter was reached the crystal developed twins apparently from several pieces of iridium that attached to the surface at that point. The oxygen level can be adjusted on future runs to decrease the occurence of iridium metal. As a result of the twinning some of the crystal was badly cracked, but a 63.5mm laser rod was extracted. This rod does contain some twin planes however. A 5mm spectroscopic cube was also fabricated from the twinned region. Another small rod of 5mm diameter by 20mm long was cut from the boule cone and is twin free.

TABLE 2: Growth Conditions

Growth Run	Pull Rate mm/Hr	Rotation RPM	Oxygen %	Average Diameter mm	Length at Diam mm	Fraction Crystallized %
NRL-9	1.5	15	0.25	21x25	125	34

FABRICATION

Rods of 5x63.5 and 5x20mm were cut and polished. The long rod has laser quality end finishes and the other is for spectroscopic evaluation. A spectroscopic cube 5x5x5 mm was also fabricated. The residual boule sections were delivered also.

PLANS FOR NEXT QUARTER

At this time no further runs have been scheduled.