

**Colored Stones:**

# A New Synthetic Ruby from Greece Poses Challenges for Gemologists

## *Standard Tests May No Longer Differentiate Between Natural & Synthetic*

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**S**ince the advent in 1982 of the Ramaura synthetic ruby produced by Redondo Beach, Calif.-based J.O. Crystal Co., the gemological community and the trade have survived with considerable equanimity the first shock of the introduction on the market of this difficult synthetic ruby.

Identification of the Ramaura was at first considered very problematic in those cases where residual flux droplets and "fingerprints" were absent. The study of growth peculiarities and trace elements subsequently furnished identification possibilities, although the observation of such characteristics generally requires a certain stone volume or minimum size of a sample.

The identification of modern synthetic stones seems to have become more and more a laboratory matter since, in an increasing number of cases, standard gemological methods can no longer reveal the differences between natural and artificially grown crystals.

### **New Ruby Poses Problems**



In April, a new synthetic ruby, grown by a flux process, was delivered for testing independently at two Swiss gemological laboratories. This new synthetic ruby may create considerable difficulties for the identification of clean or slightly included stones if standard gemological tests alone are performed.

Even when advanced tests are applied, such as UV-VIS spectrophotometry, EDS-XRF or identification of growth planes, the material may present difficulties in identification.

The producers of the new synthetic

ruby, J. and A. Douras, a physicist and an electrical engineer, run a small family synthetic crystal business in Piraeus, Greece. Their previous speciality was in the field of precious metal refinery.

In their self-built furnaces, they produce synthetic rubies by a flux technique with controlled spontaneous nucleation. Seed crystals are not used in their growth technique.

  
**Douros synthetic rubies  
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natural stones in  
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and dichroism.**  


After some years of experimentation, they started commercial production in 1993. The stones were presented for the first time at the Athens Jewelry Fair in February. A first report was published in the Greek jewelry magazine, *Chrysotechni*.

It is the goal of the producers to make their synthetic rubies as close to natural as possible. Therefore, they are doping with various trace elements to reach the different shades of colors encountered in natural rubies.

Their individual growth technique leads to higher production costs compared to the crystals produced by the Verneuil or

Czochralski pulling method. The Douros flux method may yield crystals of 20 to 50 grams and smaller, and the largest produced up to now has been a 70-gram crystal. The stones are sold to a couple of dealers from different countries.

### **Color of Crystal Varies**

The color of the crystal varies from a saturated red to a violetish red and purplish red, depending on the amounts of chromium, titanium and iron present. In some samples, blue color zones, representing a portion of blue sapphire, have been seen.

The physical properties of Douros synthetic rubies do not differ from natural stones in refractive indices, density, absorption spectrum, fluorescence and dichroism. Usually they are but slightly included and do not have platinum platelets or lancets. Some might show residual flux droplets of an orangy-yellow color.

### **Inclusions Like Treated Naturals**

The flux in larger portions is polycrystalline and granular in appearance, always containing a gas bubble. Where the droplets are small, the yellow color is no longer visible, but the tiny bubbles are still present. Such inclusions look very similar to heat (and borax) treated natural ruby, which nowadays represents the main trade mass of ruby.

The composition of the flux has been investigated by SEM-EDS (scanning electron microscope with energy dispersive system) and we found it to consist mainly

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## New Synthetic Ruby Poses ID Challenges

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of lead. In contrast to Ramaura synthetic rubies, bismuth and lanthane have not been found up to now.

Although the Douros rough crystals look almost identical to the Ramaura material, the flux composition enables a differentiation.

Also, the presence of trace elements of the same kind as in natural rubies makes these rubies different from the Ramaura. In most of the new Douros synthetic rubies, we have identified some lead by EDS-XFA (energy dispersive x-ray fluorescence analysis), which reflects the growth medium of the crystals.

### Type of Twinning Seen

Natural rubies are usually different from these new products by their structural characteristics and their mineral inclusions. They often show intercalated fine

twin lamellae in one, two or three spatial directions, leaving the characteristic intersection lines.

Such structural features were not observed in the Douros material, although a special type of repeated or penetration twinning was observed on crystals, as is occasionally in most of the different brands of flux synthetic ruby.

### Needles Not Present

Even after heat treatment, included foreign crystals may exhibit their proper crystal shapes and help to identify natural ruby. Rutile needles or their relict traces after a heat treatment, are not present in the Douros synthetic rubies.

If internal growth planes are studied by immersion microscopy, natural rubies usually show preferences for individual crystal faces which are not yet observed

## Russia's Diamond Chief Resigns

Valery Rudakov, the president of Almaz Rossi Sakha (Diamonds of Russia and Sakha), Russia's main diamond company, has resigned, reportedly because of ill health.

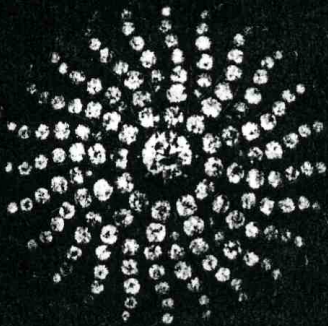
He has been replaced by Andrei Kirillin, the company said. Rudakov will remain as a member of the company's advisory board.

in synthetic flux grown rubies. On the other hand, most synthetic crystals possess growth planes that do not occur on natural material. ♦

*[This article is a preliminary report of a paper to appear in the Journal of Gemmology.]*

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