Density Tracers for Minerals and Diamond (high RD range) applications

DIAMOND
Transluscent Luminescence Index Tracers

For calibrating and checking X-ray sorters

- 7 luminescence indices
- 4 sizes 2mm, 4mm, 8mm and 25mm

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DIAMOND Transluscent Luminescence Index Tracers

Luminescence Index Tracers mimic diamonds in terms of density and are offered in seven luminescence levels to simulate the response to X-rays of high-luminescent and low-luminescent diamonds. Like diamonds, they should be translucent to light, so that the luminescence, to some degree, is a volume effect, not just a surface effect.

They are commonly passed through a sorter to provide a basis for adjusting the sensitivity of the photomultiplier tubes which detect the presence of diamonds. Those adjustments are usually made with no feed gravel passing through the sorter. It is important to also conduct tests with feed on to check for diamond losses which may result from overloading or other causes.

Luminescence Index Tracers are not designed for use as Spiking tracers. Such use would subject them to wear, which would increase their densities.

Procedure

The manufacturers of X-ray sorting machines recommend procedures for calibrating and testing their sorters. In an ideal world one might recover a large number of small and large diamonds from a deposit and characterize them all for luminescence response in a sorter with configuration similar to those to be employed in the plant. Armed with such knowledge for each size fraction, one could calculate a sorter sensitivity setting which would strike the best financial compromise between maximizing diamond recovery and minimizing concentrate contamination.

Such analyses are rarely conducted, but most operators realize that recovery can deteriorate rapidly as a result of wear on key components, buildup of dust, or factors which alter particle trajectories. Consequently it is important to test frequently.

One regime which may be useful with some classes of machine is as follows:

1. Select a size of LI tracer within the feed size range for the sorter to be tested.
2. Select a luminescence value corresponding to diamonds from your deposit which you would not wish to lose.
3. At the start of each shift, turn off feed to each machine and conduct routine cleaning and adjustment.
4. Introduce 20 tracers to one channel of the machine.
5. If some report to rejects*, increase sensitivity (usually photomultiplier voltage) slightly and repeat the test. If none report to rejects, slightly reduce sensitivity and repeat the test.
6. Continue making small adjustments to find a sensitivity which is just sufficient to recover all 20 tracers.
7. Repeat the procedure for each channel in each sorter.

* The number reporting to rejects may be monitored in a number of ways:

- A counter will indicate the number of detections, and listening for the ejector and the rattle of the tracer may indicate whether it was successfully ejected and will later report to a glove box.
- For these offline tests, some users fit a removable basket to the ejection leg of the sorter, so that a clear result is immediately available. Tracer losses are limited to only those which were not ejected.
- In statistical terms, a binomial test which yields 20 successes from 20 trials indicates that one may be 95% confident that the underlying probability of recovering diamonds with the selected luminescence, exceeds 86%.

Load Testing

For a number of reasons, including masking by non-luminescing particles, or alteration of trajectories, ejection when feed is on may not be reliable. Tests may be routinely conducted to assess the effects of feed load. A test may involve the addition of 100 tracers of the size and LI value normally used for calibration of the machine in question. Baskets cannot be used, and the result may have to await completion of sorting in the glovebox. If the recovery rate is significantly below that indicated by the calibration procedure, it may be appropriate to reduce feed rate to the sorter in question.

If more than one sorter is tested using the same tracer size and LI value, test schedules should be co-ordinated to avoid confusion over which tracers arrive at the glove box at what time. For sorters which treat coarse gravel, where diamonds are rarely found, it may be feasible to generate a rapid result, relying only on the number of logged detections.

Diamond Transluscent Luminescence Tracers can be ferromagnetic to facilitate retrieval from plant streams or in the lab, or nonmagnetic.