

### Letter of information

#### New method of oil tracers control without equipment in oil fields

*Commentary:*

We use tracer insertion to estimate oil deposit reserves. Tracer substance is pumped into a well and as it appears in other wells, deposit geography is determined. Dilution ratio estimates oil reserve. Research of tracers in oil-water emulsions and brine water develops in two directions.

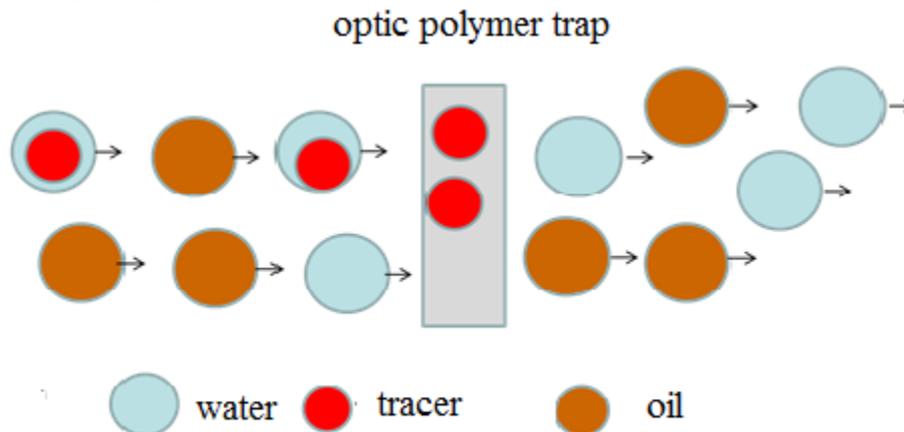
Firstly, analytical equipment becomes more complicated – from photometry to chromatography, which makes analysis cost grow and makes it impossible to determine tracers immediately in site. The way to avoid this is to transport samples. Secondly, it is the development of tracer sorption and extraction from samples to increase their concentration before determination.

Currently it is pointless to carry out work in both directions. It is pointless to adapt to oil solutions methods, initially meant for water solutions. It is impossible to catch up quickly and without sufficient financing.

From our point of view, solution for this problem is analytical procedure which includes the following stages:

1. Tracer concentration in sample collection site into a transportable form, which allows determining concentration within a few days or weeks.
2. No or inexpensive photometric equipment that operates at fixed wavelength or without analytical equipment (i.e. software for determination of tracer concentration right in site).
3. Determination rapidness.
4. Indifference to sample compound (operation in oil, water, their emulsions, and pollutants).
5. Range of work concentrations from  $10^{-2}$  mg/l and more responsive.

There is a need for a fundamentally new solution to create analytical technique that meets the above requirements. The solution is transparent molecular tracer trap. Polymeric trap will selectively absorb only tracer molecules with changed color out of the whole multicomponent sample composition (i.e. oil-water emulsion). Formation of traps as clear colorless platelets allows us to store and transport tracer without changing its concentration (the result of tracer determination is a bright 5x10 mm platelet). The platelet can also be used in standard photometers and spectrophotometers.



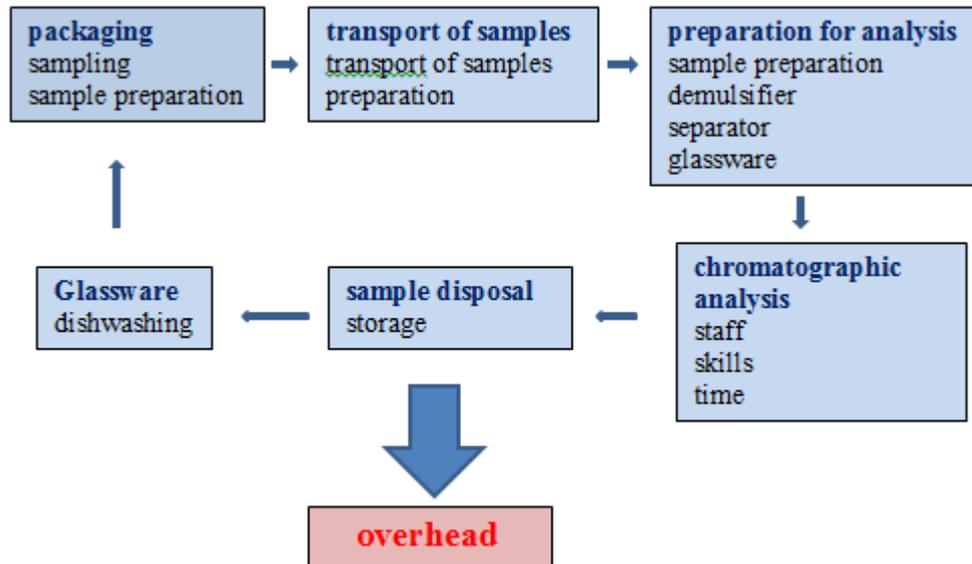
*We offer:*

1. Technology and structure of molecular tracer trap;
2. Its application technique to estimate trace content;
3. NEW! Final development stage of a portable device for tracer concentration estimate in site (analogue of blood glucose meter).

*We invite for cooperation:*

Businesses operating in the sphere of oil deposit reserve estimation or production and exploration.

*Why it is profitable:*



Single tracer estimate in oil and drilling emulsions needs collection and analysis of 20,000 0,5-liter samples. This is 10m<sup>3</sup> of liquid from 20000 sites to deliver to a lab (up to 500 km away) within 6-12 hours.

Tracer determination is carried out using expensive chromatographs and fluorimeters that require trained professionals.

The costs of maintaining laboratory equipped with an ion chromatograph, a liquid chromatograph and fluorimeters are on average \$ 1 million a year.

#### **Cost of analysis on molecular traps:**

Production cost of one trap with in-house production is \$0,1. Now photometry is necessary. Cost of one photometer begins from \$2,000, but it does not require a trained professional. There will be no need for photometry after developing a portable data processing device. Its approximate cost does not exceed \$50. Visual test method does not require special equipment.

**Total cost of single reserves estimation** with photometry is \$2,000, and there is shipping costs reduction. Special education is not necessary for the analysis.

*Example of tracer rhodamine visual test method in drilling fluid*



Visual test method takes less than ten minutes. Photometric determination is possible on standard equipment in the end (i.e. photometer of any production year).



We also offer designed optical sensors for different types of tracers: metals, xanthene dyes (rhodamine and eosin), and a number of organic substances. We can design a custom trap with change color for the tracers you need.

Tracer	DC, mg/L
Cu (II)	0,02-1,00
Co (II, III)	0,03-0,50
Ag (I)	0,04-0,80
Fe (II, III)	0,05-5,0
Se (IV)	0,09-0,5
Hg (II)	0,02-0,2
Ni (II)	0,01-0,07
Cr (VI)	0,03-0,3
Zn (II)	0,01-0,07
Total concentration (Co, Ni, Zn, Pb, Cd, Cu)	0,01-0,1
Chloride	50-1800
I <sup>-</sup> , IO <sub>3</sub> <sup>-</sup> , I <sub>2</sub>	0,06-0,8
Nitride	0,9-3,0
Fluoride	0,2-5,0
Ascorbic acid	10-100
Antioxidant activity	10-30
Rhodamine	0,1-100
Eosine	1-100

You can get more information on the proposed decision and the tests conducted by e-mail or phone. It is possible to make presentation of the method in the form of webinar.