

# Portable Real-Time Organic Compound Toxic Detector with NanoParticle reagent

Presented by  
Francis Leung,  
Bioanalyser Co., Ltd  
May 2021

# Business Problems in Global Supply-Chain Industry

- Due to be over limit of **phthalate or plasticizer substances** can cause Carcinogenesis, Mutation or Reproductive (CMR) diseases, consumer products safety regulations in different countries set limitation of those organic compound strictly to be used in the consumer product and shall be tested before delivering to the market of import countries.
- Phthalate/Plasticizer shall be strictly not be over 0.1ppm to exist in food or food contact product and cosmetics; not over 1000ppm of various phthalates in toys, children and infant articles, etc., according to Product Safety Regulation of US CPSC and EU REACH Directive globally.
- **Due to be very expensive of total cost of building up in-house chemical laboratory need to spend for RMB 2 Million in which included GC-MS, nitrogen gas, laboratory hardware setting, etc. (Please see lower right-hand side photo)**
- **So that develop a cost-effective and real-time organic compound detector but its test result is highly similar to the test result of HPLC or GC-MS used in 3<sup>rd</sup> party laboratory.**
- The testing cycle in 3<sup>rd</sup> party lab is spent for 1-3 days for meeting a tight mass production and delivery order but need a triple pay additionally required by 3<sup>rd</sup> party Lab.



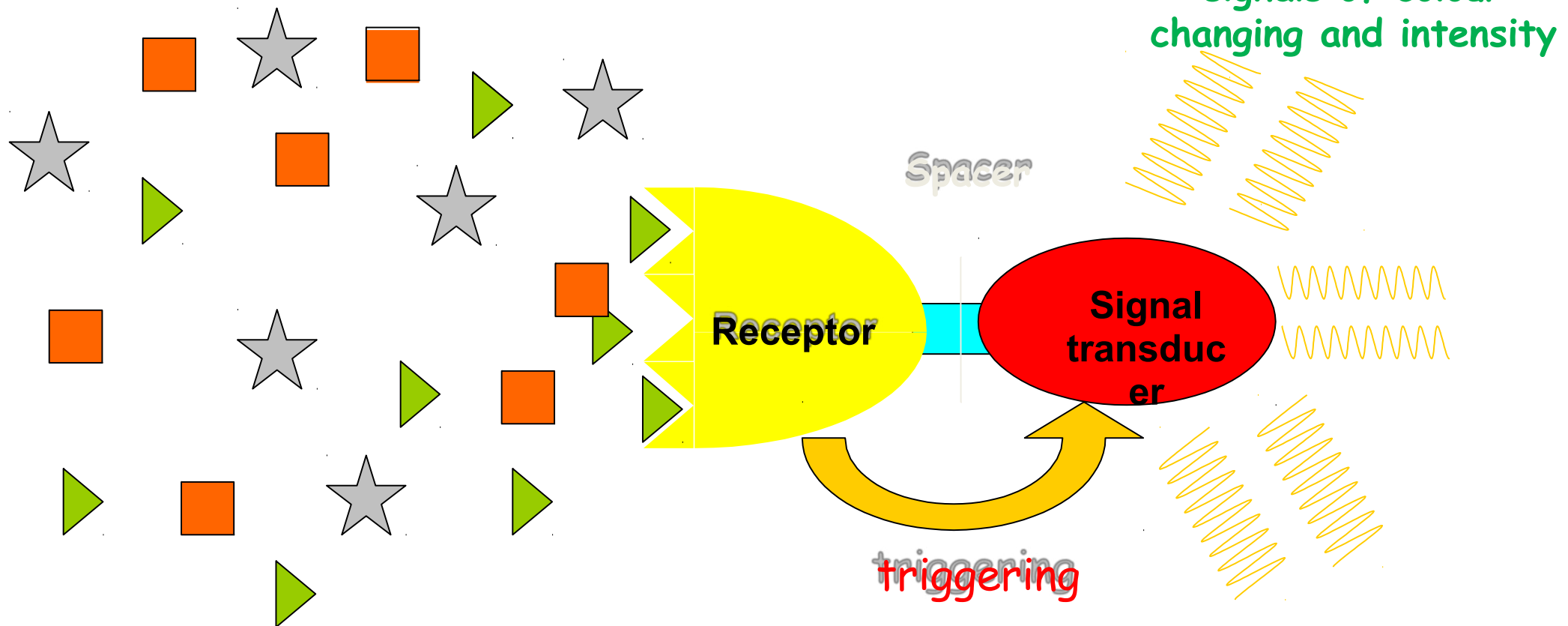
Agilent 5975C Series GC/MSD



## Performance, productivity and confidence.

Welcome to the next generation of the industry-proven Agilent 5975 Series MSD — the most popular GC/MS of all time. The Agilent 5975C inert MSD with its Triple-Axis Detector gives you innovative design features to boost your lab's productivity and advanced analytical capabilities that enhance your results—and your confidence. In addition to delivering better MS resolution and the lowest mass deviation available, the system offers superior sensitivity and spectral integrity. Advanced analysis routines let you get more information from every run, and the latest version of automated spectral deconvolution, identification, and quantification software provides higher quality analyses with even less operator time and attention. [More.](#)

A novel rapid test approach for saving testing time and cost, the theory of this approach is chemosensor shown below:

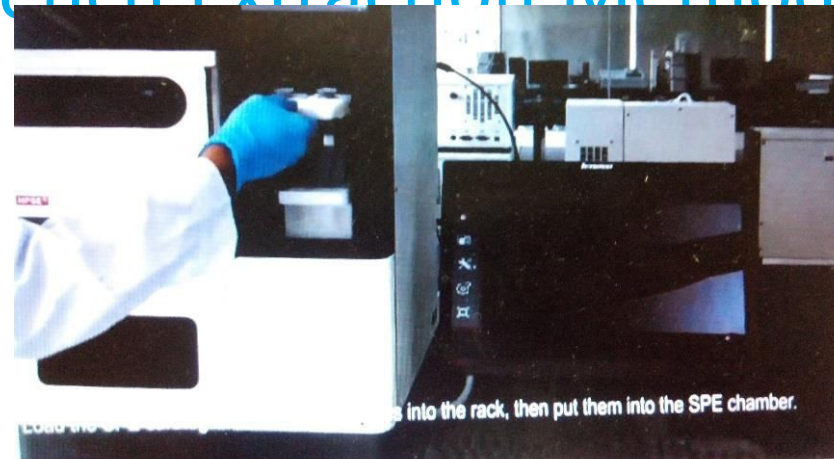


Chemosensors of Nanoscale Polymer are colour changed molecular sensors, which is able to selectively recognize and reversibly bind targeted molecular entities and yield measurable concentration of the target analyte in term of colour intensity signals. The reason why this NanoParticle sensor is powerful in detecting very low concentration of the target analyte for achieving test result highly similar to the test result of GC-MS, but the test cost is lower than GC-MS

ten times? It's because that NanoParticle sensor is nanoscale reagent and its production method looks like injection molding method to mold the variety of different target molecular structure particularly, such as Plasticizers, PAHs, BPA, SVHC (REACH Directive in EU), etc.; therefore, the detection cost is low and the test result of NanoParticle sensor possess higher sensitivity due to



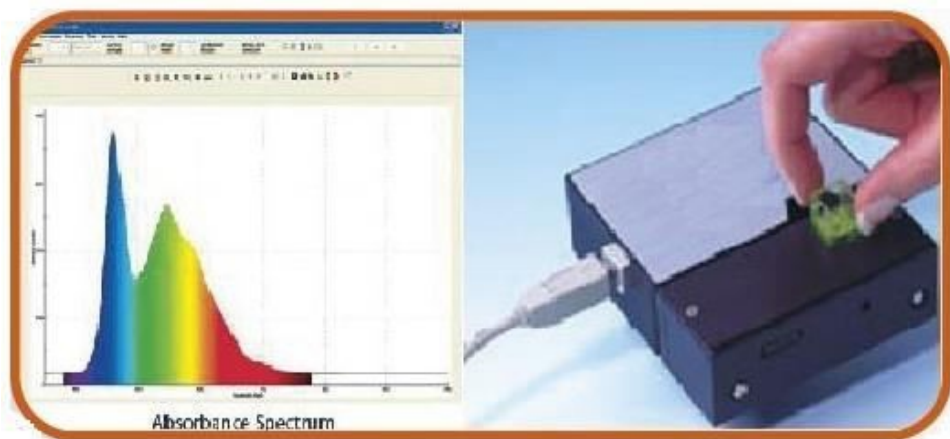
## Conventional Automatic Bench Extraction Method



# New Automatic Extraction Method Using Automatic Portable Extractor & H

- Extraction method using microwave technology for 15 min;
- The effectiveness of recovery in extraction can achieve 85% or above and its recovery extraction result is highly similar to the extraction processes shown in the standard test method of CPSC-CH-1001-09.3

The commercial product of the portable extractor look like the image shown as right-hand-side. This portable extractor has applied CE mark already.



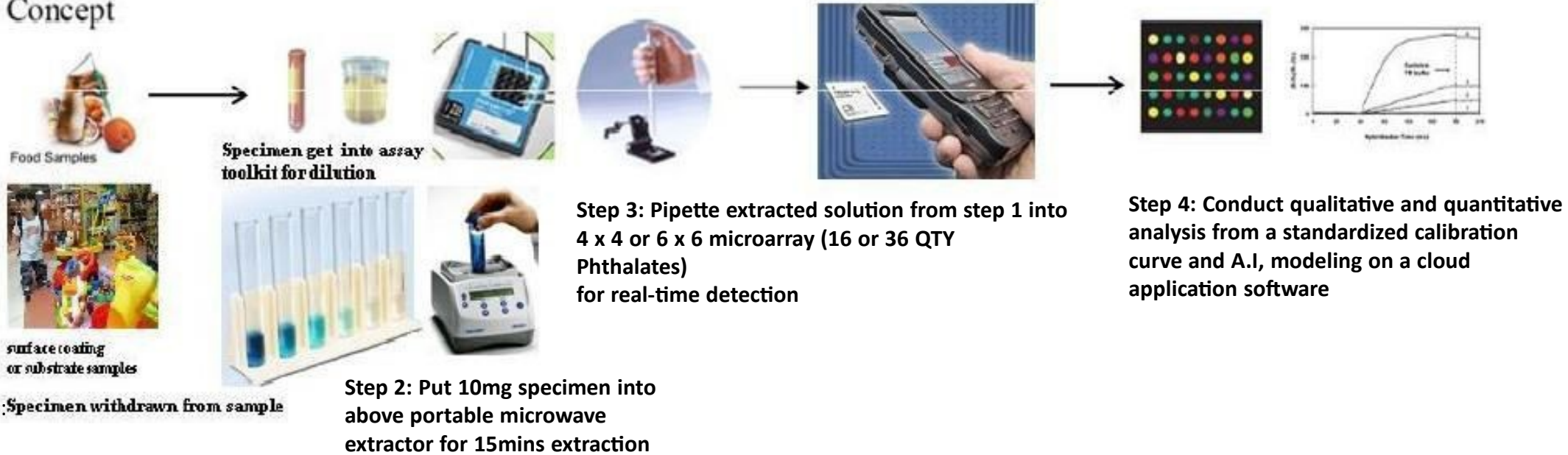
There are two handheld detectors shown as left hand side will be proposed:

- One is miniaturized spectrometer for the usage of conventional cuvette but its sensitivity is as same as a large size of spectrometer with patentable technology;
- An other one (shown as lower left-hand side) is a novel handheld detector with 4 x 4 or 6 x 6 microarray lab-on-a-chip for a customized combination of SVH or PAHs and other substances inside the matrix test chip for different customers' needs to conduct screening test.



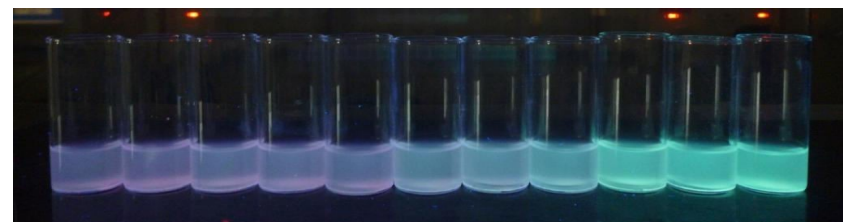
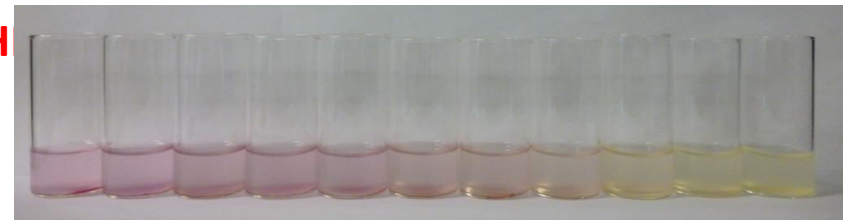
- The functional prototype of portable extractor and handheld detector shown below figures;
- Our NanoParticle reagent can be produced by ourselves internally and then coat the reagent onto the glass chip of microarray for inserting it into the detector for qualitative and quantitative

ar Concept



The concentration of target analytes (e.g. phthalate, DEH which can be down to 1ppm (2uM, 07ppm)

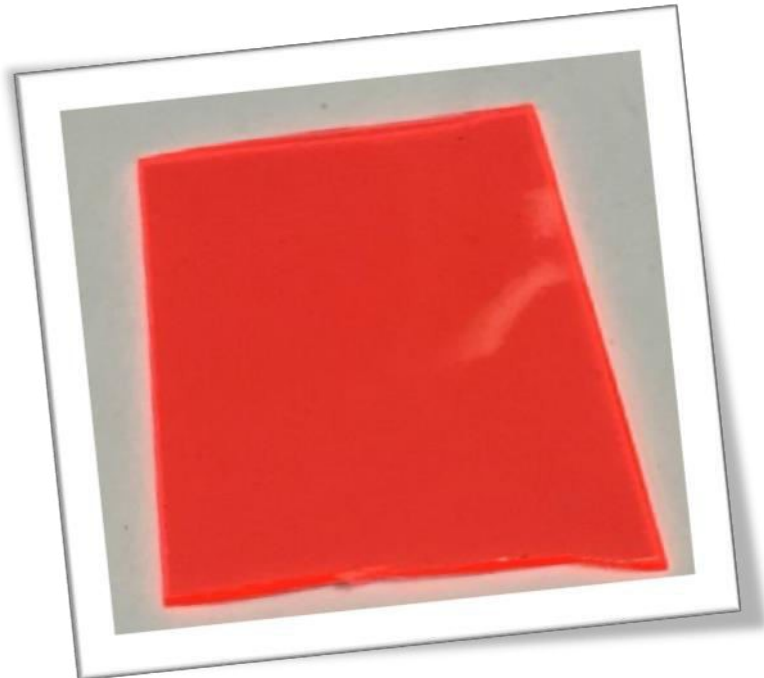
magnitude,



DEHP in ethanol concentration: (1) 0 uM; (2) 2 uM=0.7ppm; (3) 6 uM; (4) 10 uM; (5) 20 uM; (6) 60 uM; (7) 100 uM; (8) 200 uM; (9) 600 uM; (10) 1 mM; (11) 2 mM=800ppm .

# Screening test for phthalates in plastic material sample was examined by a local HOKLAS 3<sup>rd</sup> party laboratory before

1. To determine the content of phthalates in the PVC sample provided by SGS using a traditional GC-MS method (CPSC-CH-C1001-09.3) for blind test (Due Diligence);
2. To verify the recovery of phthalates when ethanol is used in the extraction processes other than conventional extraction method in CPSC-CH-C1001-09.3;
3. To compare the differences between GC-MS determination and our novel NanoParticle-based screening test method.



A PVC sample broken down from a toy supplied by a local HOKLAS accredited testing laboratory with known phthalate content as a reference material

# Comparison of Test Results between GC-MS determination and NanoParticle reagent in the examination

Determined via traditional test method CPSC-CH-C1001-09.3:

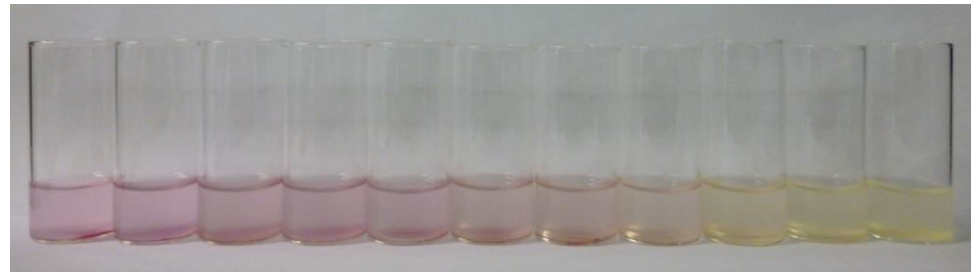
Extraction method is conventional heating in vessel with THF for few hours (depends on operator skill)

1. DEHP, %(w/w) : 0.67;
2. DINP, %(w/w) : 0.34;
3. DnOP, %(w/w) : 18.5.

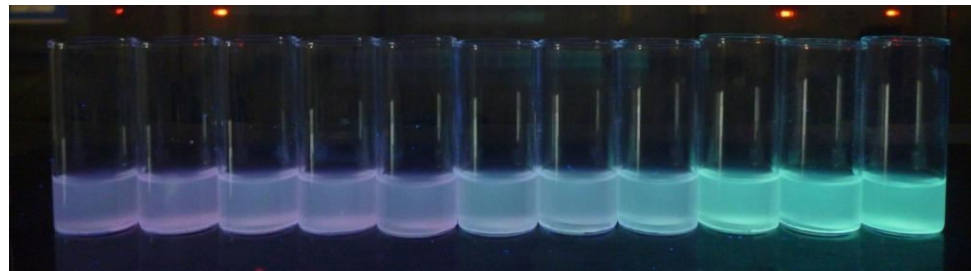
Our extraction method with ethanol is microwave digestion for 15 minute

Determined via *in-house* ethanol extraction\* adopted for NanoParticle sensing for 20 minutes totally:

1. DEHP, %(w/w) : 0.57;
2. DINP, %(w/w) : 0.30;
3. DnOP, %(w/w) : 17.1.



1 2 3 4 5 6 7 8 9 10 11

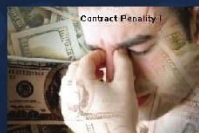


DEHP in ethanol concentration: (1) 0 uM; (2) 2 uM=0.7ppm; (3) 6 uM; (4) 10 uM; (5) 20 uM; (6) 60 uM; (7) 100 uM; (8) 200 uM; (9) 600 uM; (10) 1 mM; (11) 2 mM=800ppm .





消费品的安全对你下一代放心吗？



担心因供应链品质管理不善，而违反产品安规，  
被罚大额赔偿，最后蚀掉公司！？



## 需使用性价比高的便携式实时塑化剂检测仪

步骤一：  
从成品抽取样本



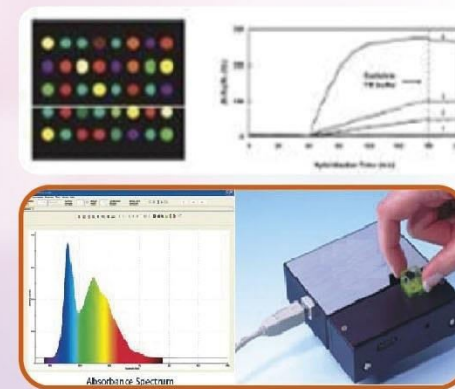
步骤二：  
加热分解样本



步骤三：抽取已过滤的样本于小试管中，或测试片中进行分析。



步骤四：进行样本分析，并显示 PPM 值。



便宜过海外牌子价钱，使用国外优质光学部件，性价比较 FTIR 可靠；助你快捷地检测各种如下消费品内的塑化剂致癌物 ppm 含量。准确度下限可达 1 ppm<sup>\*1</sup>，  
适合消费品 OEM / ODM 生产商、零售商、买办、海关和环保团体使用。操作简便，不需具备化工知识和经验，受训三小时考核后即可使用。



药品



宠物粮食



塑料容器



副食品及保鲜膜



化妆护肤品



玩具

本公司产品是香港本地大学科研团队研发，拥有专业化工专家提供  
售后技术支援，打造 Made in Hong Kong 的优质科技工业品牌；以市  
场需求导向，制造与销售成本效益，价格合理的精密而且准确的优  
质检测仪器。

公司联系方式：

Bio-analyser Co., Ltd (生物分析器有限公司)

办公联系时间：上午 9:00 am - 13:00 pm

下午 14:00 pm - 17:00 pm

电邮：info@bio-analyser.com

电话：59306348 (梁先生)

\*1: 在理想的萃取恢复率条件下

# Advantages of NanoParticle Chemosensor Technology

Advantages of Extraction for the novel NanoParticle detection on phthalates or other organic substances:

- 1) Only need 15 minutes for extraction using ethanol solvent, if adopting general heater and pressurized vessel.
- 2) If adopting mini microwave for extraction, just need 15 minutes.
- 3) No harmful solvent for the operator, who has not chemistry training.
- 4) This novel extraction method can be conducted by onsite service

Advantages of this rapid NanoParticle detection:

- 1) Only need to detect phthalates within 1-5 minutes for quantitative analysis
- 2) This real-time portable NanoParticle chemosensor with optical instrument can be conducted by onsite detection
- 3) The test result can be transferred to cloud database service for retailer program or manufacturer supply-chain quality management program for your inspection team.



## Advantageous features of Real-Time Organic Compound Detector with chemosensor reagent

- U support onsite supply-chain quality control and testing by using a real-time in-situ measurement and destructive analysis method, in which is better than FTIR; because lowest concentration of organic compounds mixed with the majority of other polymer of plastic cannot be quantified by FTIR technology directly
- U Non-demanding on sample volume; need very little extracted liquid sample only
- U No need to build up an expensive in-house chemical laboratory and pay a higher long-term operational cost
- U Low technical requirement from operators, who do need to study chemistry or analytic chemistry before
- U Rapid analysis and able to provide real-time responses by using a miniaturized extractor and detector
- U Very short testing time, just 20 minutes per each sample; but also there is automation microwave and test instrument for rapid and stable testing quality.
- U Very low testing cost per each organic compound, just HKD10 average

## Team Profile

- U Research team of local university and our core members have fully experience in developing cutting-edge lab-on-a-chip technology for the application of novel screening test method for global supply-chain industry and 3<sup>rd</sup> party laboratory testing service industry
- U CTO and Managing Director had educated in research-based master program in the development of nanotechnology and microfabrication, especially focus on Lab-on-a-chip technology for biomedical IVD device; besides, he knows how to develop software program, firmware, integration of a complete sensing device, etc., due to his education background of BSc in Computer Science at Victoria University, MSc in Nanotechnology and Microfabrication at Wales University, Bangor (UK), MSc in Biomedical Engineering at CUHK and BSc in Testing and Certification (Major in Analytic Chemistry) and working in supply-chain business in toys and other consumer products



## Technical Challenge

- U Lack of support on applying US ASTM and European ISO/EN standard of a novel test method from ITC of HK Government for our invention;
- U Business collaboration with local 3<sup>rd</sup> party chemical lab or oversea chemical instrument manufacturer will be appreciate, because we need to conduct verification of test method compared with GC-MS or HPLC as the evidence for the application of a new ASTM/ISO standard screening test method;
- U Lack of independently governmental finance support on our prototype production and the application of a new ASTM/ISO standard screening test method; we thus want to work with local commercial association to apply Public Sector Trail Scheme (PSTS) for HKD five Million to complete the commercial portable extractor and detector and the application of a new ASTM/ISO standard screening test method in three years. **(Normally, a new standard shall be completed in ASTM or ISO for three to five years; but the commercial products can be completed in three years because the initial prototype was proven of concept already.)**
- U Lack of financial support on the novel technological talents introduced to Hong Kong from US, EU and Israel Universities by HK Innovative and Technological Bureau, ITC and

## Target Marketing Segments

- U SME Factories (Upper stream of supply-chain) e.g. Toys factories, Cosmetics factories, etc.
- U Global Retailers (Down stream of supply-chain) e.g. Tesco, Carrefour, Walmart, etc.
- U Global Buying Office and Trading companies of consumer products
- U International commercial 3<sup>rd</sup> Party Laboratories and Government chemical laboratory
- U Universities, School, NGO, custom, consumer products safety section

# Marketing Strategy

- Our business model bases on global sale to the right manufacturer, and/or global retailers; or
- bases on business collaboration with industrial association/3<sup>rd</sup> party laboratory/global retailers to apply government funding for gaining our one set of our complete detection kit for a free-of-charge evaluation and work with us together to complete a whole application processes of a new ISO and ASTM standard screening test method thoughtfully until the new standard test method gained in order to save lot of compliance cost for global customers and long-term operational cost of running their in-house chemical laboratory; or
- bases on investment model.

## Business Model

- Our business model based on global sales, the selling price will be:
- Every complete tool kit of portable extractor and handheld detector with 20 sets of phthalate MiP reagent (each set of phthalates NanoParticle reagents have nine phthalates complied with CPSIA 16 CFR part 1307 and California Pro65; namely, DINP, DNOP, DIDP, DPENP, DHEXP, DCHP, BBP, DBP and DEHP). After 20 sets of phthalate NanoParticle reagent were consumed totally, just buy new one new set NanoParticle reagent for testing every time;
- Every complete tool kit of portable extractor and handheld detector with free of charged 20 sets of phthalate NanoParticle reagents will be HKD 380,000 (This cost is made for prototype, commercial product after mass production will perhaps be reduced to HKD280,000 later); other SVHC NanoParticle reagent can be detected with this kit;
- HKD10 for each phthalate NanoParticle reagent; each set of nine phthalates NanoParticle reagents is disposal and is charged for HKD90 that can be tested one single time

**The End of Presentation**

**Thanks you**