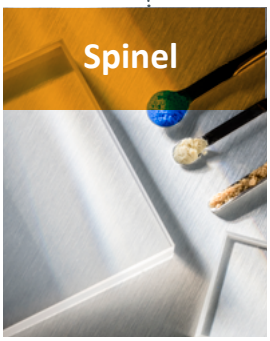
Baikowski®

Solution partner for

FINE MINERALS

INORGANIC DETECTORS

4N SUBMICRON ALUMINATE POWDERS
& DOPING SOLUTIONS



1. Detection principles

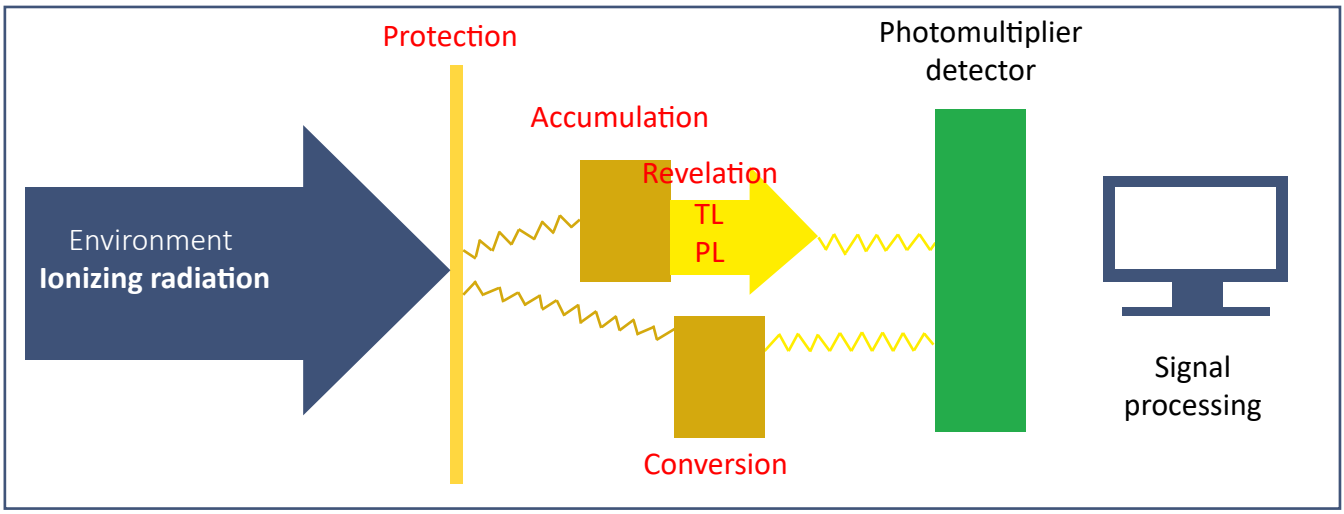
> Ionizing radiation cannot be directly measured. The detection is done indirectly using an ionizing radiation sensitive material. For the detection of ion radiation in the UV and visible wavelength range up to 800nm, scintillators with luminophores can reveal this signal by two manners:

- A process of energy **accumulation** and restitution in the form of light emission, either by heating (**TL = thermoluminescence**) or by light excitation (**PL = photoluminescence**),
- **Direct conversion**.

> To ensure an effective detection, it might be necessary to protect the system from physical or/and chemical aggressions of its environment.

In this case, **the protection** can be brought by transparent materials such as **alumina and spinel ceramics** that let the incident radiation pass through.

The required properties are the **high crystallinity** for crystals and the **transparency** for ceramics.



2. Miniaturization of detection systems

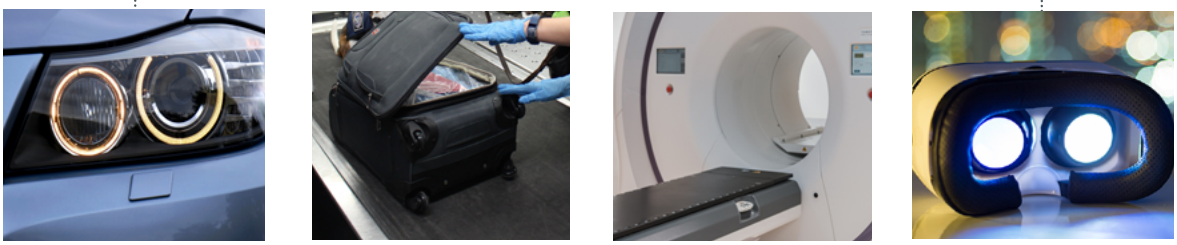
> Unlike organic detection, the detection of ionizing radiation through inorganic materials has the advantage of providing **mechanical, chemical and thermal resistances**. These characteristics are essential in **medical, safety, energy, electronic and watch applications** like in the following examples:

- Inorganic scintillators in the medical sector

They are most often coupled with a camera to allow a digital acquisition like in the structural imaging with CT scans and MRI, but also in the functional imaging, which is part of the nuclear imaging, with positron emission tomography scans.

The speed required for examinations and the acquisition of several images in a short period of time impose dramatic constraints on the materials of the scintillator, with the main challenge of getting rid of an afterglow effect that could spoil the image accuracy,

- Security gates for trucks and baggages at the airport,
- Waste sorting and quality control tables in the industry,
- Geophysical exploration such as the location of hydrocarbons,
- Car headlight LEDs, including adaptive headlights,
- Luminescence effect for watch,
- Thermal glasses…



> In most applications, we are witnessing **a growing miniaturization of inorganic detectors**. As a result, the need of **submicron aluminate powders,** which is our core business, is expanding.

3. High Quantum Efficiency conditions

> In order to maintain a high accumulation or conversion efficiency, whereas the size and thickness of detectors and photomultiplier tubes continue to decrease, Baikowski® not only manufactures **4N submicron powders** with a:

- High crystallinity, phasic and chemical purity
- Controlled size distribution

> but also, preserves these properties in all **customized formulations**

$$QE^* = \frac{\text{number of photoelectron emitted}}{\text{number of incident photons}}$$

**Quantum Efficiency*

4. Ease of use of Baikowski® solutions

> Considering that product design adapted to our client's manufacturing processes is part of our DNA, Baikowski® provides **ready-to-use** solutions such as:

- Spray-dried powders,
- Ready To Press powders,
- Slurries

Baikowski®

> Moreover, to guarantee **fine ceramics without porosity**, all our **powders** offer optimized characteristics in terms of:

- Granularity control
- Processability
- Flowability
- Functionalization

> Our **slurry** characteristics are:

- Low viscosity
- High load rate

5. Baikowski® customized detection offer

> Our know-how is to deliver **tailor-made solutions** based on our **current offer:**

- $MgAl_2O_4$
- $Y_3Al_5O_{12}$, YAG:Ce^{3+}, co-doped YAG
- $Lu_3Al_5O_{12}$, LuAG:Ce^{3+}, co-doped LuAG

Discover our phosphors and spinel solutions.

> In addition, our **development areas** allow us to have good control of the synthesis of cutting-edge products for the detection market, including:

- Magnesium spinel with controlled stoichiometry,
- Specific spinels such as strontium and zinc aluminate,
- YAG and more broadly the family of controlled formulation alumina garnets,
- Alumina in various forms, doped and/or not doped.

PRODUCT DESIGN

> **Contact us** and we will develop together the product that meets all your specific needs and requirements.

- Doped $MgAl_2O_4$
- $SrAl_2O_4$, $ZnAl_2O_4$
- Ce:GAGG
- Al_2O_3:Tm^{3+}, Al_2O_3:Dy^{3+}, Al_2O_3:Er^{3+}

6. Scientific publications

> YAG thermal barrier coatings deposited by suspension and solution precursor thermal spray
(October 2017: R. Moronta Perez, L. Boilet, P. Aubry, P. Palmero, L. Henrard, O. Deparis, V. Lardot, F. Cambier/ **Baikowski® YAG slurry**)

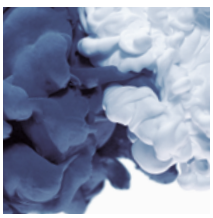
> Improving Optical Transmission of Spark-Plasma-Sintered YAG-Ceramics: Effect of Powder Conditioning and Post-Treatments
(May 2021: T.A. Owoseni, A. Rincon Romero, Z. Pala, F. Venturi, E.H. Lester, D.M. Grant, T. Hussain / **Baikowski® YAG slurry**)

> 3D Printing of Transparent Spinel Ceramics with transmittance Approaching the Theoretical Limit
(March 2021: H. Wang / **Baikowski® spinel S30CR**)

> Gel-casting of MgAl2O4 transparent ceramics using a common dispersant
(January 2019: Mengwei Liu, Shunzo Shimai, Jin Zhao, Jian Zhang, Dan Han, Yi Li, Juan Liu, Shiwei Wang / **Baikowski® spinel S25CR**)

> See more scientific publications

Your solution partner for fine minerals



Baikowski®

Baikowski® SA
France | Poisy | +33 4 50 22 69 02

Mathym® SAS
France | Lyon | +33 4 78 83 72 93

Baikowski® Malakoff Inc.
USA | Malakoff (TX) | +1 903-489-1910

Baikowski® International Corp.
USA | Charlotte (NC) | +1 704-587-7100

www.baikowski.com
sales@baikowski.com

Follow us:

Sales Representative in China
China | Shanghai | +86 21.6289.2883

Baikowski® Korea Co, Ltd.
Korea | Seoul | +82 255.281.97

Baikowski® Japan Co, Ltd.
Japan | Chiba | +81 474.73.8150