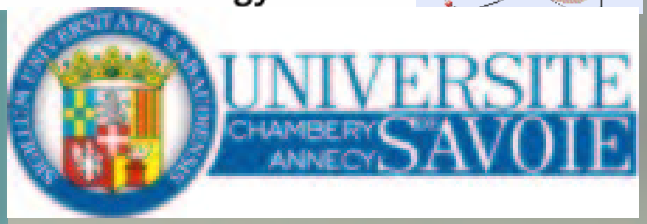
Belarussian
State University

Anodic alumina as a perspective multipurpose material

Presented by G.Drobychev

Collaboration



J De Baerdemaeker, C Bas, A. Borisevich, N Charvin, P. Crivelli, K Delendik, N Djourelov, G Drobychev, S Gninenko, M Lomello, Y Mugnier, P Nedelec, C A Palacio, D Sillou, O Voitik, …

Anodic alumina as a potential material for MCP production

- Effective secondary electron emitter.
- Possible to produce structure of necessary geometry.
- Surface of plate is up to 50*50 mm.
- Thickness is from several up to 250 μm.
- Channels diameter from 10 to 250 nm (natural porosity).
- The technology exist to produce samples with any required channels diameter starting from about 5 μm.
- Recent results allow to be optimistic concerning AAO electric resistance reduction.

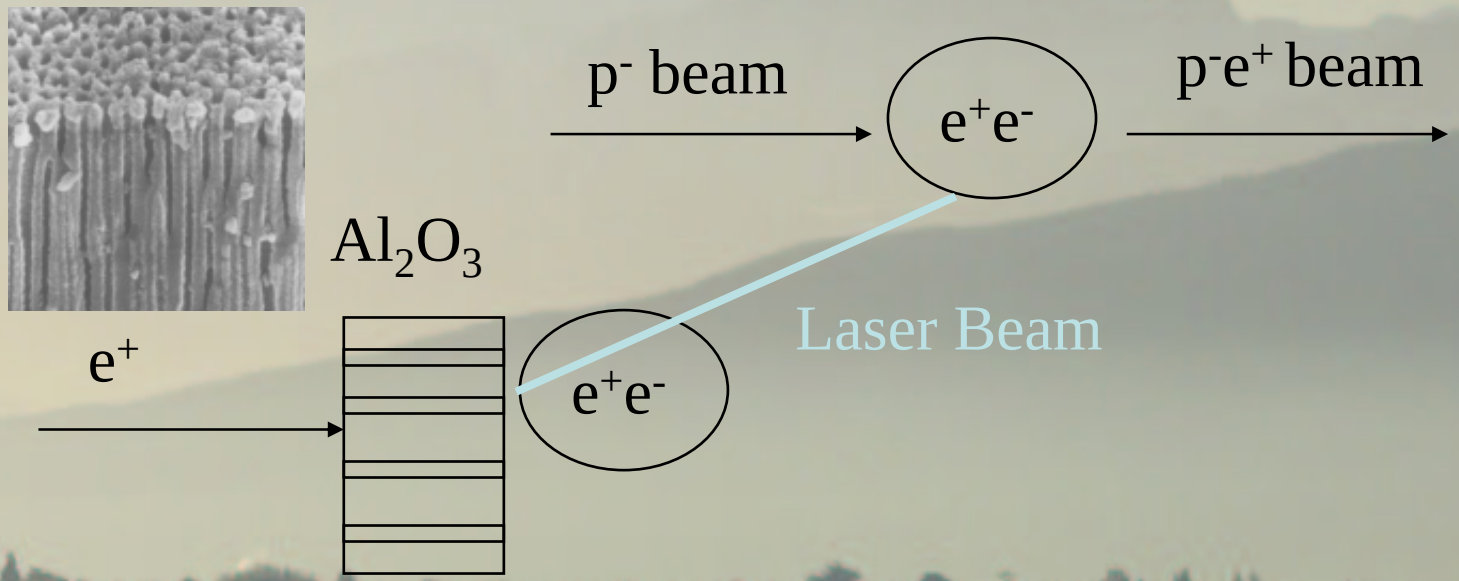
Anodic alumina as a potential material for MCP production – plans

- To complete systematic studies of the AAO resistance reduction methods in order to optimize technology.
- To test amplification of the AAO MCP with increased conductivity and channels enlarged by etching.

- In case of positive results:
- To restore contacts with industrial partners, who can produce a prototype of the ultra-compact PM on a basis of the new MCP.
- …

Anodic alumina as a potential material for positronium production

An antihydrogen beam experiment setup (AEGIS):

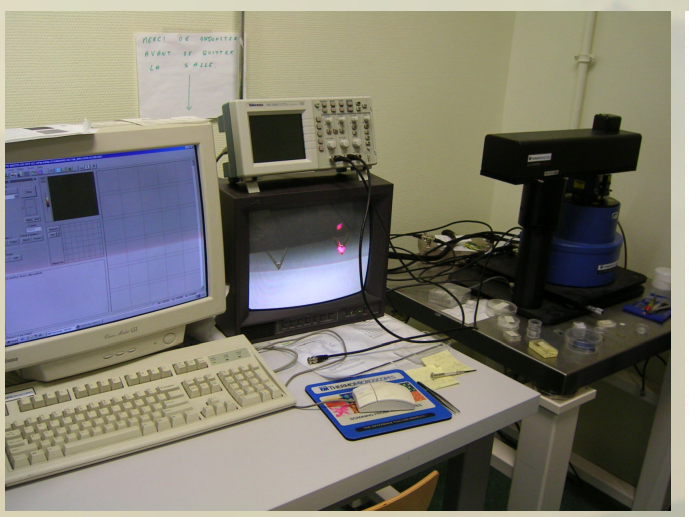


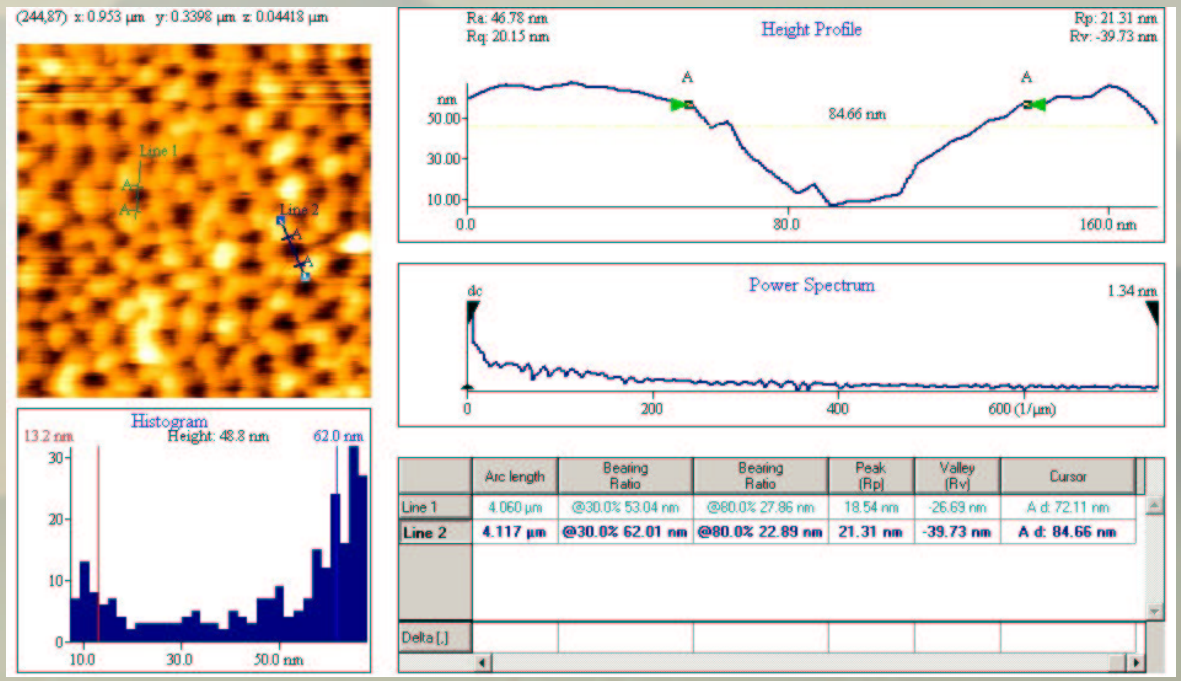
Anodic alumina as a potential material for positronium production

- Thickness can be from several to 300 μm
- Diameter of channels are precisely controlled in the region from 10 to 250 nm (natural porosity) and from 5 μm with use of etching technology.
- Regular porous structure with possibility to remove barrier layer (open channels)
- Total surface is up to 5*5 cm and 7*7 cm with special production technology
- Surface of channels to total surface ratio up to 50%

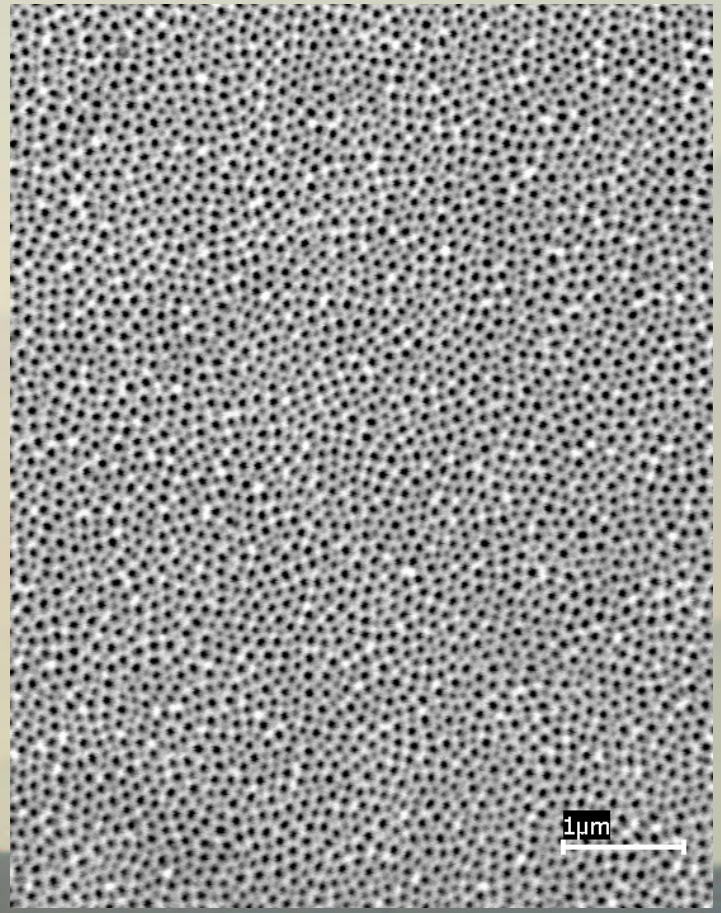
Anodic alumina for positronium production – what research was already done:

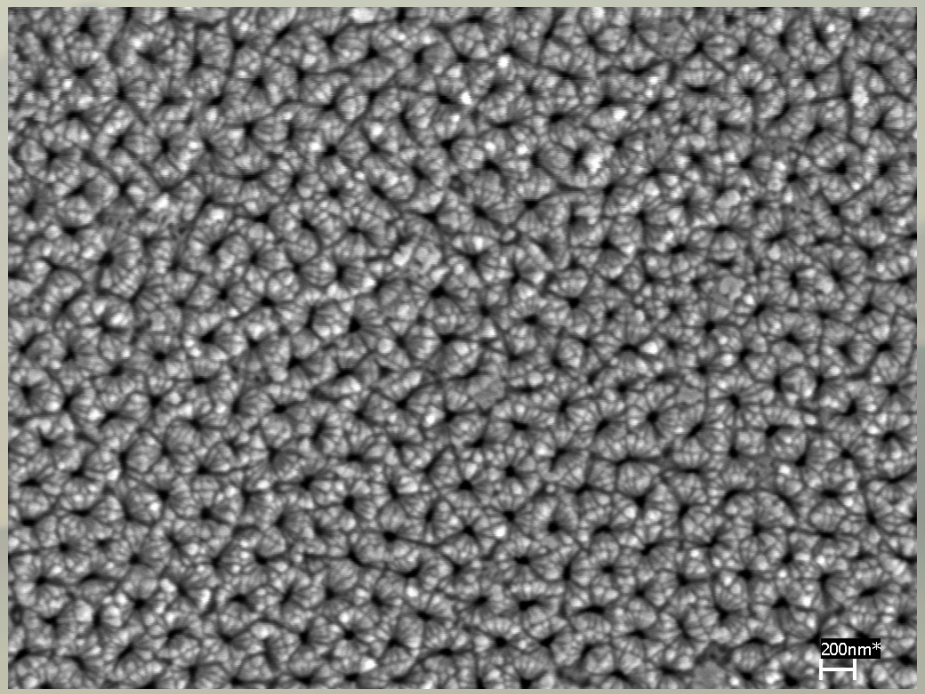
Preliminary surface studies with atomic force microscope (ESIA)



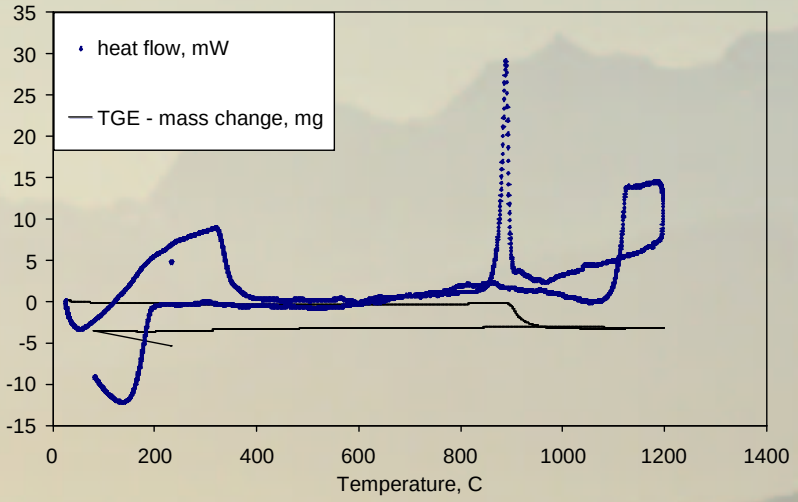


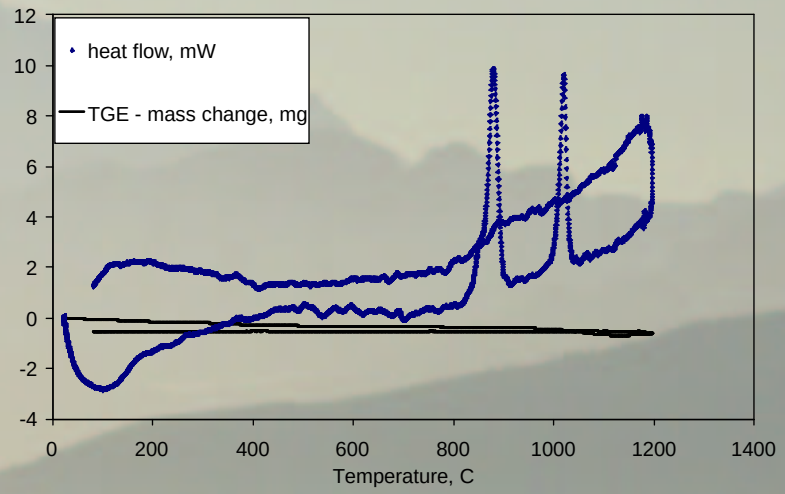
Electronic microscopy (Minsk)

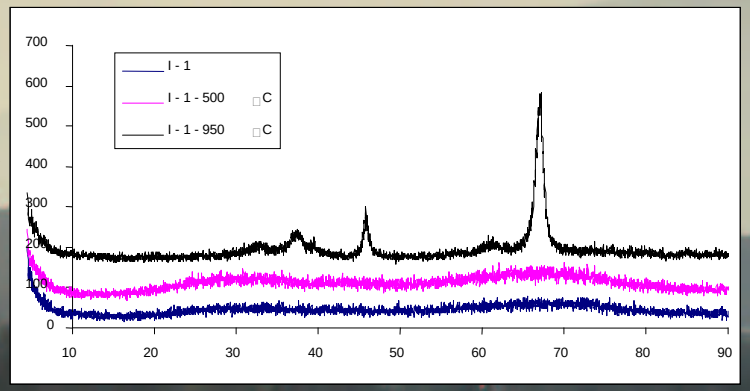


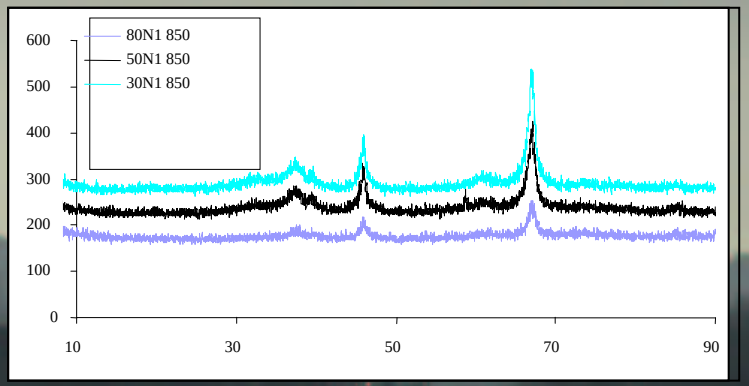


Structural studies (LMOPS, ESIA)





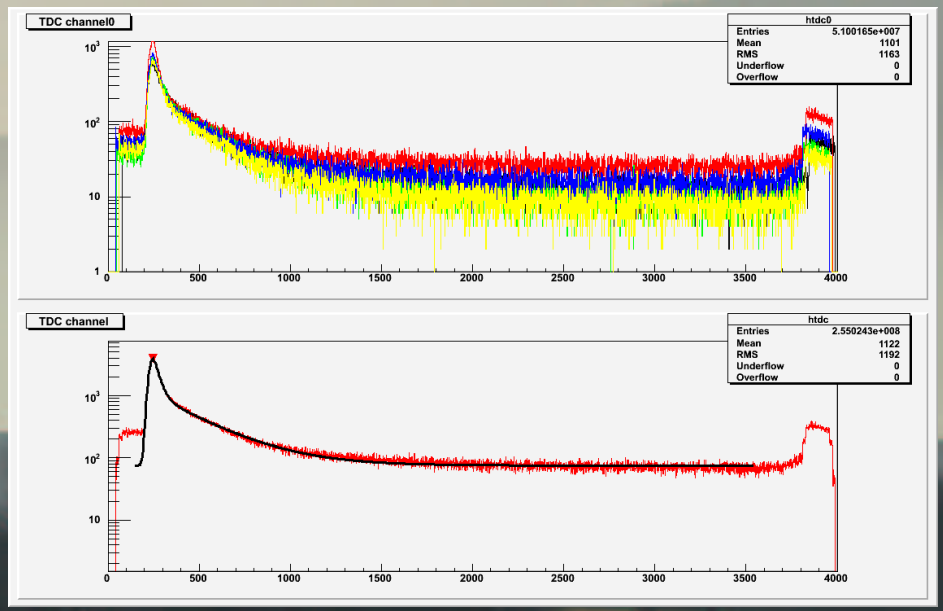




Positronium production experimental studies

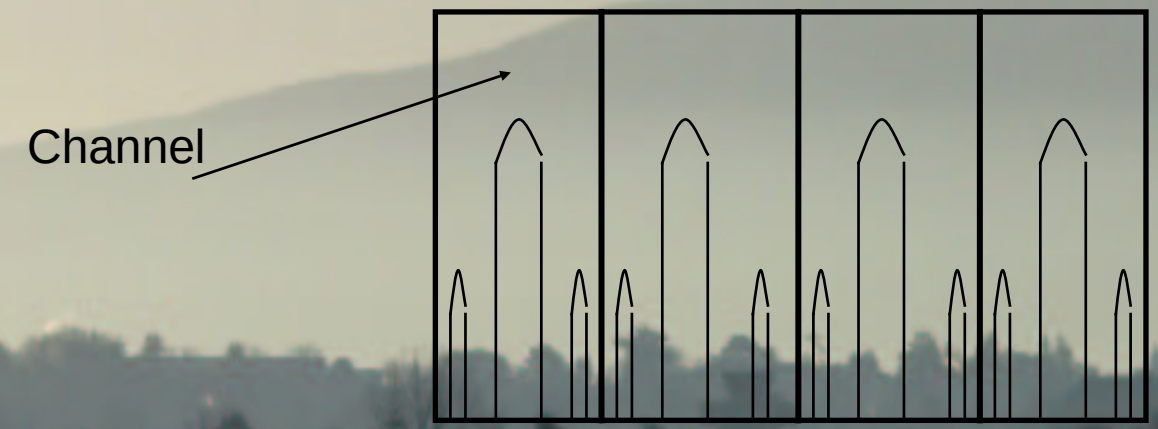
- Tests at radioactive source at LMOPS:
  - The results are positive, the details are presented by N. Djourelov.

- Test at slow positrons beam at CERN:
  - Two different samples were tested up to date, the data are still under analysis.



Anodic alumina for positronium production – future:

- To test AAO samples at high and low temperature with radioactive source at LMOPS.
- To test more samples at the beam facility (time of flight).
- To test dendroid structure:



Anodic alumina as a potential material for filtering

Sizes of some dangerous objects:

- **Staphylococcus - 1000 nm**
- **Grippe virus – 50 - 100 nm**
- **Smoke micro-particles – 10 – 50 nm**

Anodic alumina as a potential material for catalyzing

- **Free surface of natural structure is more than 10^3 m^2/g (standard catalytic powders are about 300 m^2/g)**
- **After annealing a secondary porosity can be created, which increase surface significantly (10^4 – 10^5 m^2/g)**
- **Technology to insert nano-disperced media into secondary porosity is developed**

Conclusion

- **Nevertheless or rather slow progress of the recent years, material is very promising in several fields of application, including nuclear physics, chemistry and nano-technology.**
- **Industrial partner with interest in investments is welcomed to contact with collaborators ☺**