Minutes of the TASCA-RTC work group meeting at GSI

Time: 15. May 2006, 09:30
Location: Nuclear Chemistry Seminar room, SE 2.185
Present: Ch.E. Düllmann (CED), GSI (chair); D. Ackermann (DA), GSI; W. Brüchle (WB), GSI; J. Dvorak (JD), TUM; J.V. Kratz (JVK), Univ. MZ; J.P. Omtvedt (JPO), Univ. Oslo; M. Schädel (MS), GSI; A. Semchenkov (AS), TUM/GSI; A. Yakushev (AY), TUM.

1. Minutes from last meeting
The minutes of the last meeting are approved.

2. Brief reports from the different institutes
Univ. Oslo (JPO): -The Oslo group is ready to start building the small-image-mode RTC as soon as the design is clear and the drawings of the connecting flange/window part are available. The machine shop has been given advance notice and can be expected to be rather fast once the job is started.

- A new post-doc will start in the group in May/June 2006

GSI (CED, MS): -The gas feed system (which will also provide all gases for RTC experiments) will be installed over the summer and should ready in the fall. Pending completion of the RTCs, tests of the whole RTC system (including the RTC/TASCA interface) could be performed in a beamtime that is already tentatively scheduled for the end of October/beginning of November 2006.

Univ. MZ (JVK): -The mechanical workshop is on standby for the construction of the large-transmission-mode RTC and ready to start as soon as the design is clear and drawings are available.

3. Progress on "thin foils" and "support structure"; RTC window design
AY reports on the work that has been going on at the TUM since the last meeting:

-The CF150 flange that holds the RTC window for the large-transmission-mode is fixed. The exact position of the O-ring for the 40 x 140 mm² large window is not yet clear.

-The window support structure will consist of two layers:

1) The wide meshed grid has a honeycomb structure with Ø 2.5 mm.

2) Behind this grid, either (i) a combined "fine meshed structure + window" piece or (ii) a relatively thick foil (≥2 μm) that doesn't need the fine meshed grid, will be placed. These pieces will be mounted into a 4-mm thick frame.

-The company "Luxel" offers 140 x 40 mm² large vacuum-tight aluminized polyimide foils of 0.8 μm thickness, however for a price of 9 k$/pc, which is considered prohibitive.

-The company "Moxtek" offers 0.45 μm thick "plastic" foils with some special coating (the compositions of both are probably corporate secrets). These foils are mounted on a Ni mesh (20 μm thick, square holes of 0.3 mm side length, 20 μm wide bars, 90% geometric transmission, produced by electroetching, a photolithographic process) which serves as fine meshed support structure. According to Moxtek, such windows will withstand pressure differences of up to 2 bar. However, their maximum size is 120 x 30 mm², which would result in an open area of only 116 x 26 mm². Alternatively, they could produce 40 x 90 mm² large windows. The "Moxtek" windows look suitable for very slow evaporation residues and two of the 120 x 30 mm² ones will be ordered. The price for mounting the mesh and the foil into a custom-supplied frame and do the vacuum test of the unit is 400 $/unit, the Ni meshes alone cost 120$/pc. AY has six of these meshes at TUM.
Within one month, the flange, support structure, and foils will be ready. TUM will then build a very simple chamber for pressure testing. Thin aluminized Mylar foils from the GSI detector lab will also be tested at TUM.

For the small-image mode RTC (where more energetic evaporation residues are produced and thus no fine meshed support structure will be implemented for the moment) a 30 x 40 mm$^2$ large "test piece" of the wide meshed grid that AY got for free will be used, making the window 30 x 40 mm$^2$ large rather than round with a diameter of 30 mm as we decided earlier. However, the RTC will still have this 30-mm-diameter geometry.

All drawings will be produced at TUM in the program "Designer" and also be made available in more general file formats, e.g., .dxf. The universities of Mainz and Oslo will let AY know which file formats are most useful for their machine shops. The files will be made available on the TASCA website. All files will include a version number and the date.

We decided to stick to commercially available foils in order to prevent problems with reproducibility and so on.

The working group congratulates the TUM group and especially AY for the very fast progress!

4. Design of the two first-generation RTCs: first tests

After discussing several possible approaches how to build modular RTCs, we adopt a "LEGO"-like design. Different modules, e.g., different gas inlet and gas outlet pieces, a catcher foil holder, or spacers to change the depth of the RTC, etc., that can be freely combined will be built. This looks easier for the small-image mode RTC (to be built in Oslo) than the large-transmission-mode one (to be built in MZ), as space constraints for putting in an O-ring are more serious there.

Both RTCs should be ready by mid-October.

The gas inlet will be connected to the RTC with a 6-mm Swagelok fitting; the outlet will have a 3 mm Swagelok fitting. Later on, a smarter system that allows connecting and disconnecting the tube by hand with a simple "click" will be implemented, however, which one is not yet clear.

Some simple preliminary tests without beam could be performed, e.g., with a fission fragment or an emanating source, or with a $^{235}$U target near a n-source (reactor? RaBe source?)

A relatively large tube will be installed between the RTC and the warm lab which can serve as a protector for smaller ones to be installed inside.

The next meeting of the RTC Working Group will be held at the end of September 2006, in conjunction with the TASCA Workshop in Garching.