Active gas system status & plans.

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TRT active gas system activities.

- *First priority tasks for to address TRT leaks.*
  - Arrangements in order to reduce Xe leak:
    - Stabilization of the pressure in TRT out: USA15 – UX15 pressure difference for circulation pump operation feedback {done}, pump regulation valve repair {done}, pressure regulation parameters tuning {partially done} gave possibility to reduce pressure fluctuations to 0.15 mbar.
    - Fine remote flow regulation in gas distribution channels. – [See Sergei's Katunin report.]
    - Stabilization of the pressure in TRT input: fine tuning of the pressure regulation algorithm.
  - System for supply some TRT modules with Ar-CO_2-O_2 mixture blowing out. Mixer rack in SGX1, distribution racks in UX15 and piping. {2013 December}
  - System for supply some (up to 6) TRT modules with Xe mixture blowing out. {2014 January}
  - N_2 removal/recuperation system (on the base of existent recuperation system). Because of the TRT leak nitrogen concentration increasing rapidly and permanent replacement of the gas is needed. {2014}

TRT active gas system activities.

- *Gas system upgrade.* Some improvements for more safety, more reliability: modification of the back-up system in distribution racks, double membrane pump in membrane module, improvement of the CO_2 concentration measurement in analysis 1 system, modifications in analysis 3 rack, Xe supply & …. [See our report 15/02/2013 for more details]

- *Tests & regulations.* Automatic operation of the gas system in auxiliary operational modes (Filling, Recuperation, CF_4 mixture, Ar mixture), pressure and gas components concentration regulation algorithms in run mode, flow cell calibration, flow regulation in TRT blocks & …

- *Maintenance & reparations.*

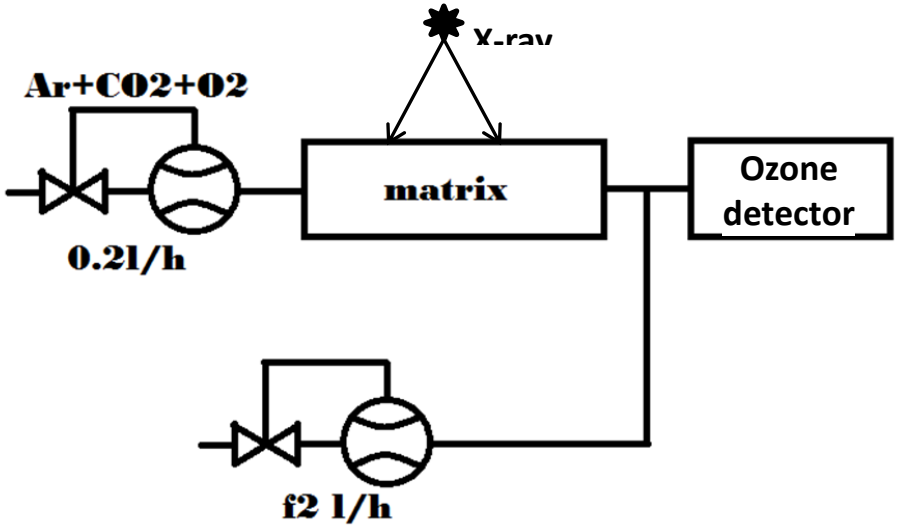
TRT active gas system activities.

		PRIORITY	PLAN		REVISION
NEW RACKS	TRT INDIVIDUAL CHANNELS XE SUPPLY BLOWING OUT .	HIGH	2013	OCT	NOV
	AR MIXTURE SUPPLY	HIGH	2013	OCT	2014Jan
	ANALYZER FOR AR MIXTURE MONITORING	HIGH	2013	NOV	2014Feb
	N2 REMOVAL	MEDIUM	2014	SUMMER	
	USA15 – UX15 PRESSURE DIFFERENCE FOR CIRCULATION PUMP OPERATION FEEDBACK	URGENT	2013	JUNE	DONE
EXISTENT RACKS	PUMP	URGENT	2013	JUNE	DONE
	DISTRIBUTION 1 DESIGN AND PRODUCTION OF GOOD FLOW REGULATORS FOR ALL MANIFOLDS USED IN GS	HIGH	2013		DEC
	Distribution 2 REMOTE FLOW REGULATION FOR EACH CHANNEL	TRT	2014		
	Distribution 3 REPLACEMENT OF THE PRESSURE TRANSMITTERS AT OUTPUT (PT 6X26) TO ± 10 MBAR (3 PIECES NEEDED) URGENT	URGENT	2013	MAY	DONE
	Distribution 4 MODIFICATION OF THE BACK-UP SYSTEM TO MAKE IT SAFER (SEE FIG. 6)	MEDIUM	2013	END	DEC
	Distribution 5 REPLACEMENT OF SAFETY BUBBLERS XBUB 6X42 AND XBUB 6X43 BY ONES WITH TWO VOLUMES (6 PIECES NEEDED)	MEDIUM	2013	END	DEC
	Distribution 6 REPLACEMENT OF BAD FLOW CELLS AND INSTALLATION NEW ONES	LOW	2014	SUMMER	
	Distribution 7 REPLACE FLEXIBLE PIPES IN BARREL CH. 1-16 BY LONGER ONE.	LOW	2014	SUMMER	
	Distribution 8 PREPARE EXHAUST FOR XE AND AR FLUSHING CHANNELS	HIGH		OCT	NOV
	PREDISTRIBUTION	URGENT	2013	MAY	DONE
	MIXER	MEDIUM	2013	SEPT	DEC
	EXHAUST	MEDIUM	2013	SEPT	NOV
	MEMBRANE	LOW	2014		
	PURIFIER	LOW	2014		
	ANALYSIS1	LOW	2014		
	XE SUPPLY	LOW	2014		

Gas mixture studies.

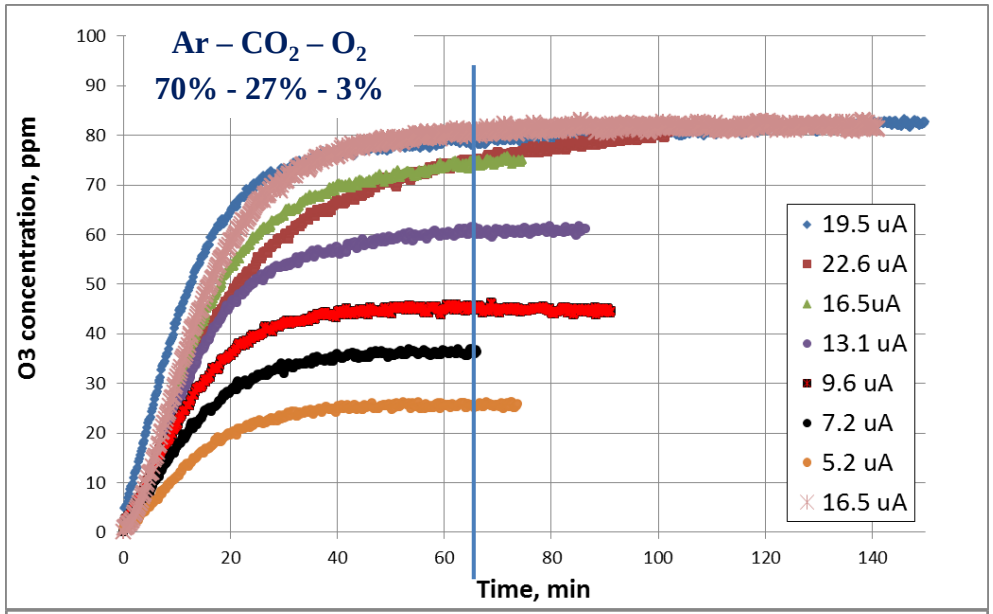
- *The idea to add some addition gas into the TRT active gas which can kill ozone somehow is very attractive. On the other hand one have to be careful with using new mixture – we could get new problems (with the aging for example). Processes of ozone production and it's chemical reactions are complicated especially on the surface and in avalanche. Systematic ozone studies is needed .*

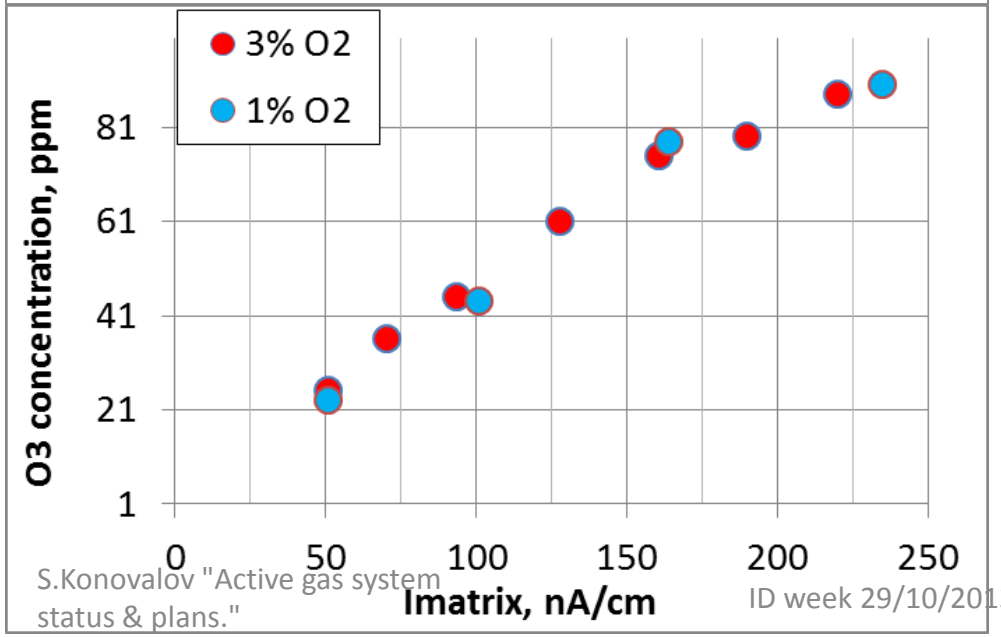
Set-up.



Straw matrix - 15 straws, 30 cm long
Current density – 180 nA/cm
Current – 24 mkA
Gas flow 0.2 l/h

Gas mixture studies.

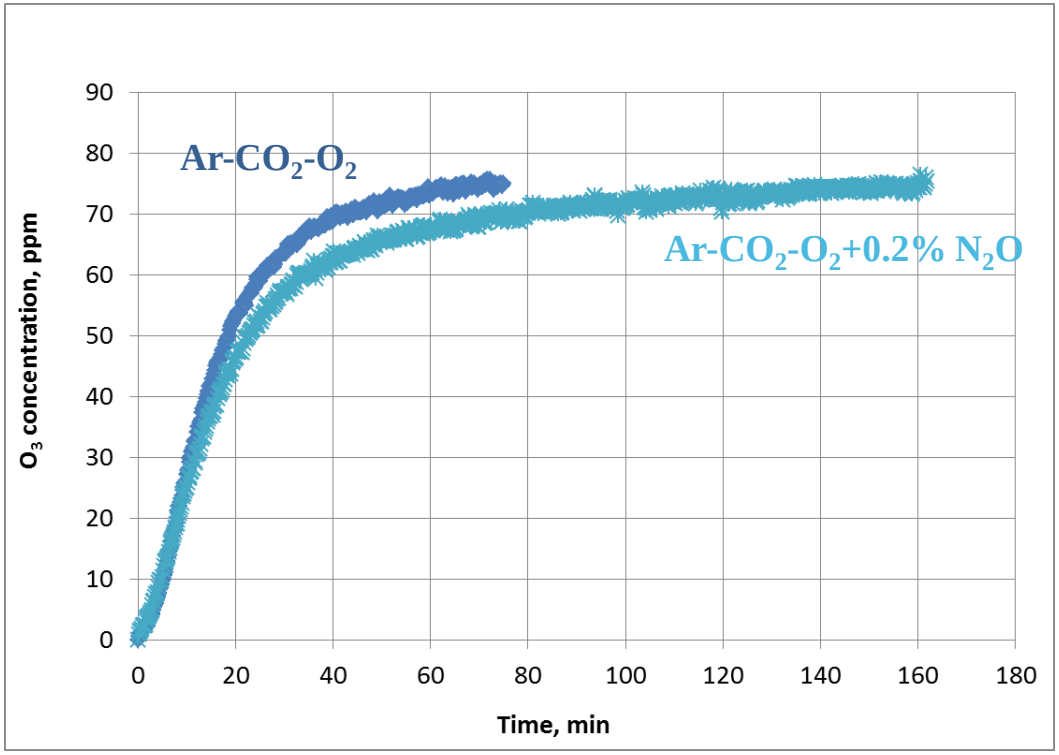




Ozone concentration VS ionization density for $Ar - CO_2 - O_2$ mixtures with different O2 concentrations.

- Dependence of the ozone concentration on the current density is linear (at least up to 150 nA/cm).
- Ozone production is the same in mixtures with 1% and 3% of oxygen.

Gas mixture studies.



Addition of the nitrous oxide dos not decrease ozone concentration.

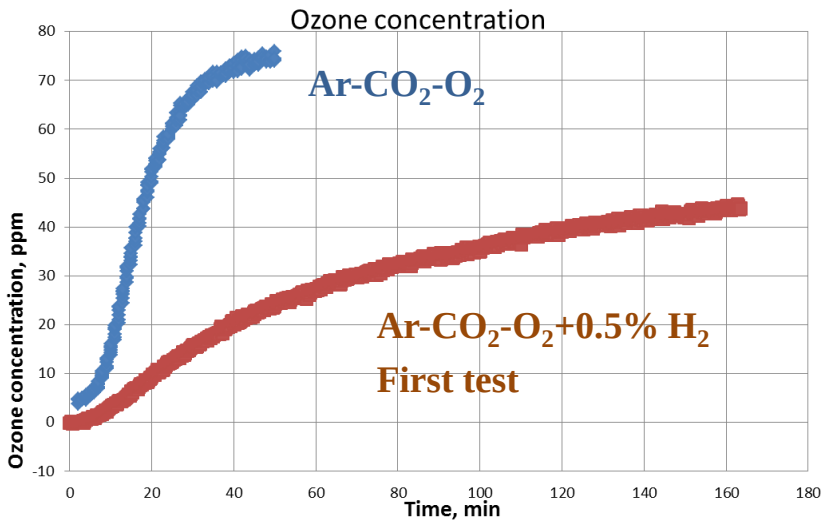
Ozone concentration in Ar mixtures with 0.2% of N_2O is the same as without $N_2O \approx 75$ ppm.

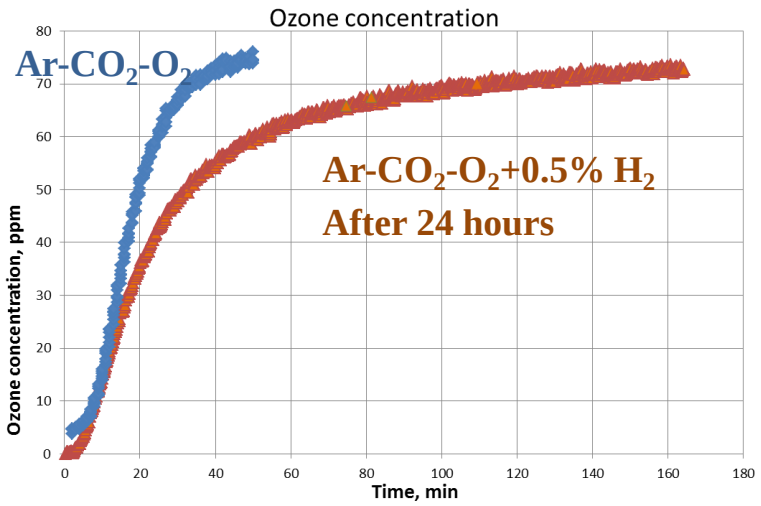
At I= 16.7 mkA, j=180 nA/cm

Ozone concentration in Xe mixtures with 1% of N_2O (130 ppm) is about the same as without N_2O (150 ppm).

At I= 25 mkA, j=270 nA/cm

Gas mixture studies.





Addition of hydrogen influences somehow on the ozone concentration. Influence of the hydrogen on the ozone concentration getting less and less. Addition of hydrogen dose not help to decrease ozone concentration.

Plans.

- More tests with hydrogen.
- More candidates: NO, NO_2, ???
- Systematic ozone studies in Ar-CO_2-O_2 and Xe-CO_2-O_2 mixtures.
- Influence of ozone on the materials.