

Formation and destruction of NDELA in MEA and DEA

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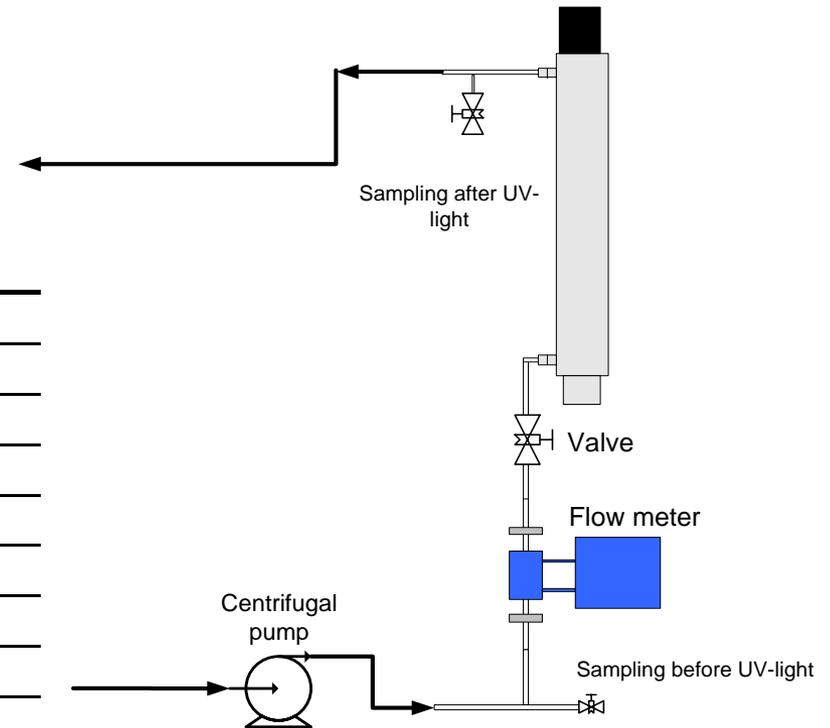
Objectives

- To study the formation of NDELA with NO and NO+NO₂ present in the gas phase
- To study the destruction of NDELA in these solutions with UV-light



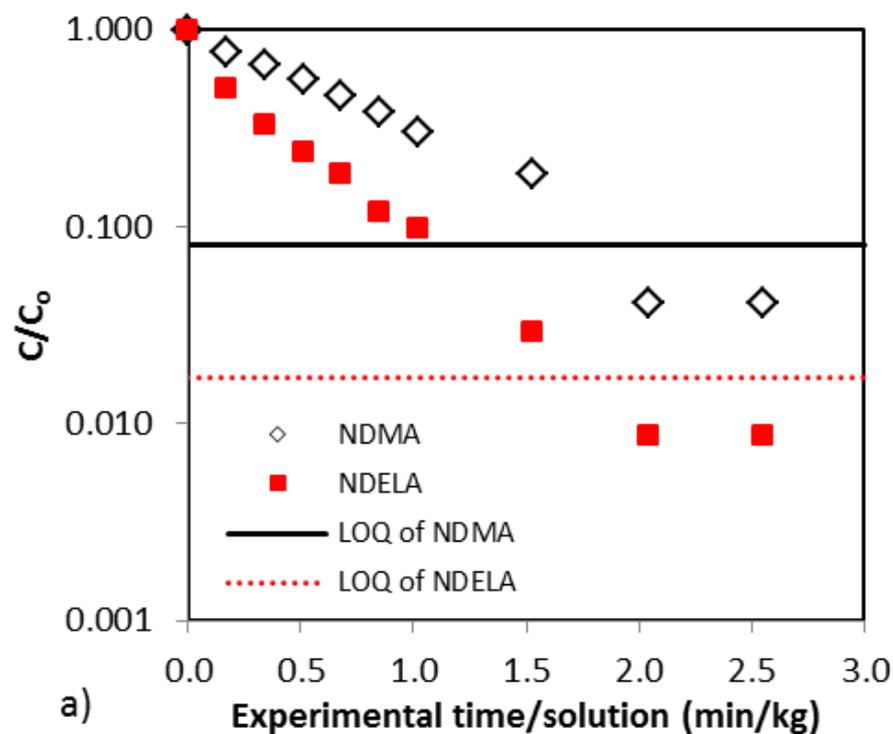
UV-reactor

	Value
Power consumption	46 W
Lamp power	37 W
Max. flow rate	37.9 L/min
Chamber material	304 stainless steel
Chamber length	90.0 cm
Chamber diameter	6.4 cm
Lamp	Sterilume-EX model S810RL
Sleeve	Quartz Model QS-810



Batch experiments

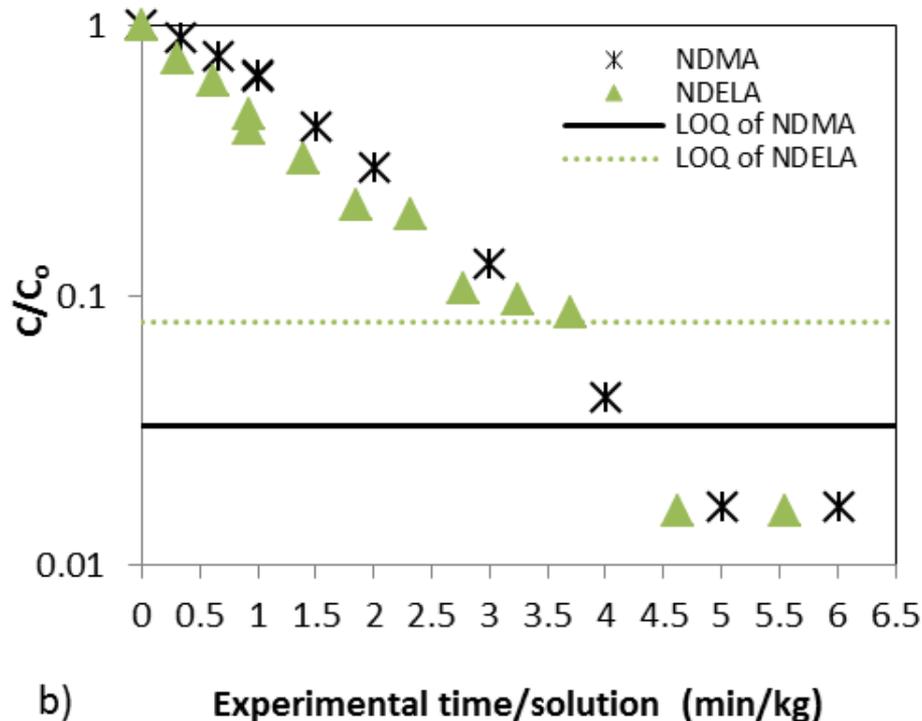
Decomposition of NDELA and NDMA in artificial water wash solution



- Start concentration
 - NDMA 307 ng/ml
 - NDELA 290 ng/ml
- LOQ
 - NDMA 25 ng/ml
 - NDELA 5 ng/ml
- Concentration of NDMA and NDELA are below the LOQ after 1 hour

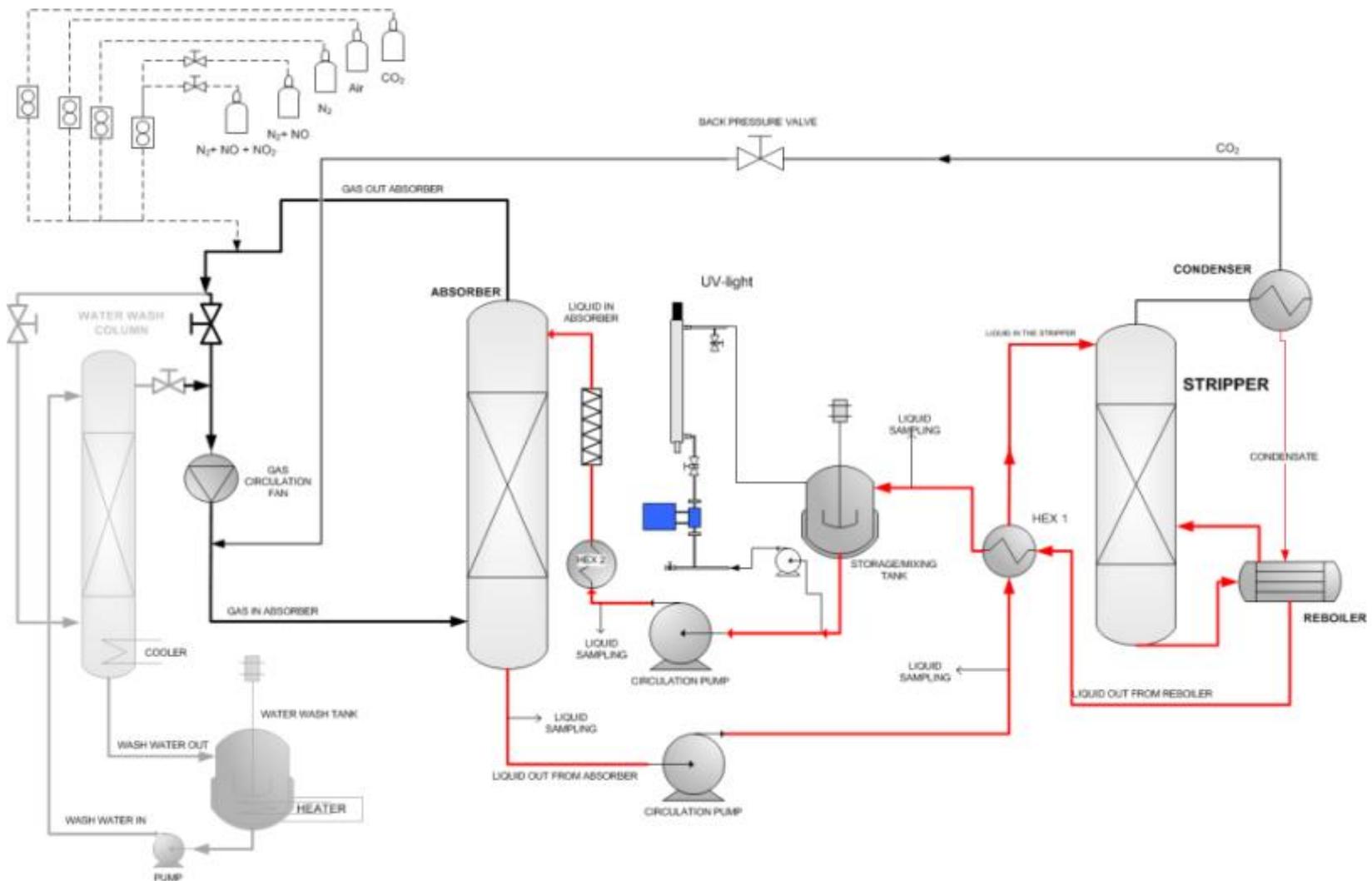
Batch experiments

Decomposition of NDELA and NDMA in fresh 30wt% MEA



- Start concentration
 - NDMA 7620 ng/ml
 - NDELA 624 ng/ml
- LOQ
 - NDMA 250 ng/ml
 - NDELA 50 ng/ml
- Concentration of NDMA and NDELA are below the LOQ after 2.5 hours

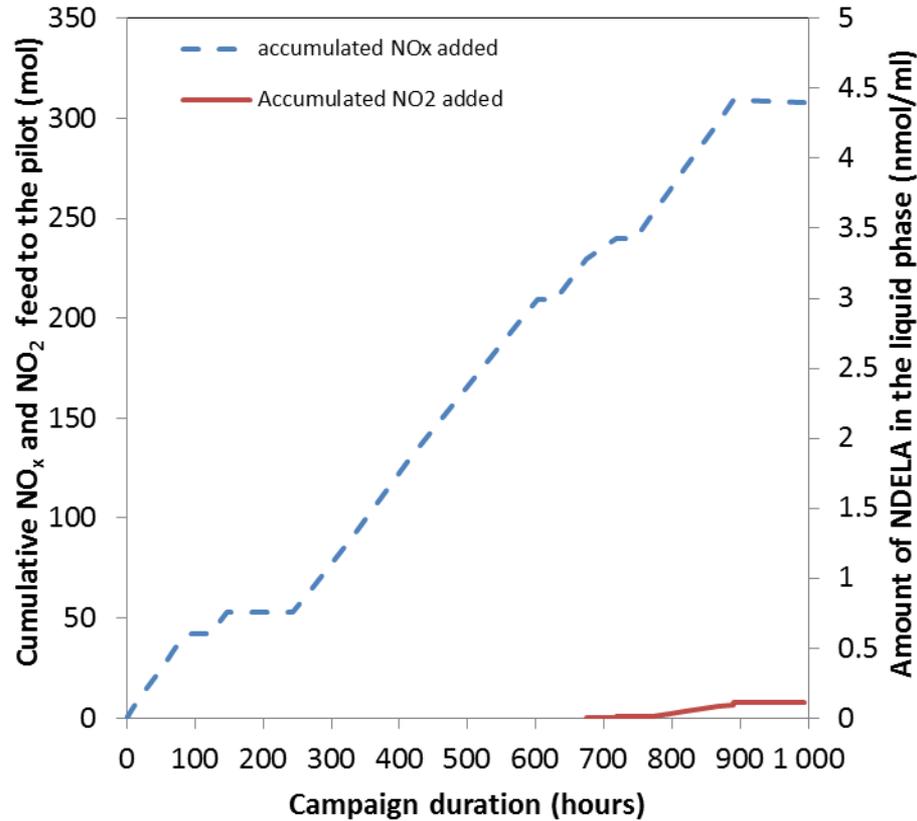
Experimental setup



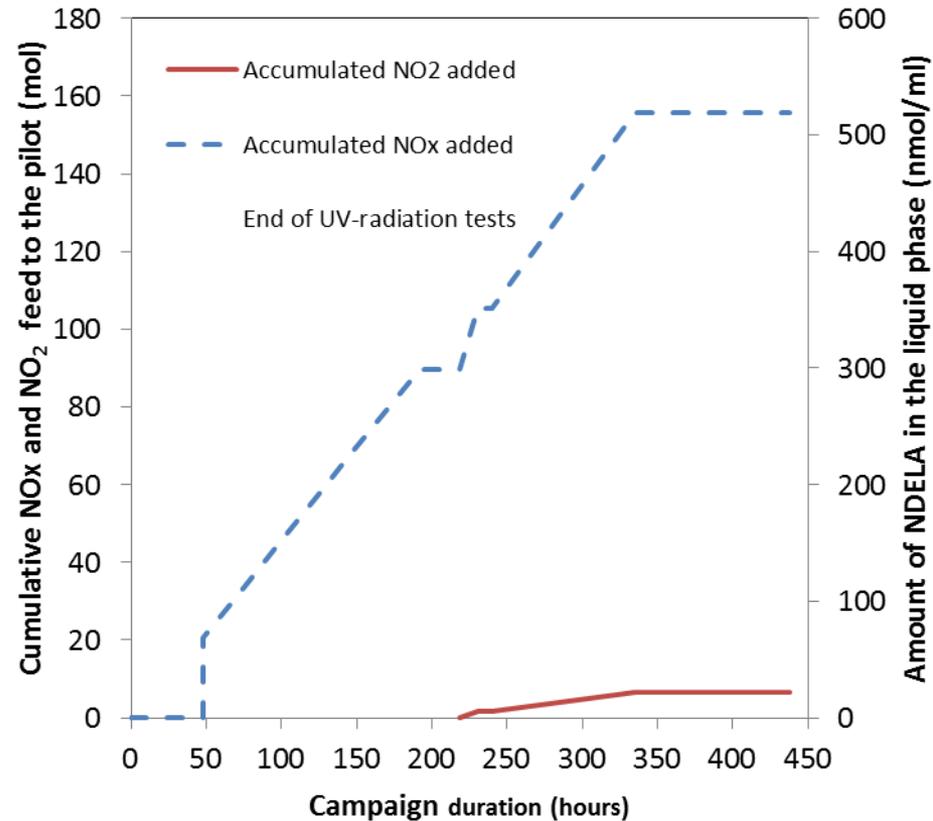
Campaigns

	30wt% MEA	50wt% DEA
Campaign duration	990 hours	410 hours
NO feeding hours	715 hours	250 hours
N ₂ O feeding hours	187 hours	100 hours
UV-light radiation in the main solvent circulation	37 hours	48 hours
UV-light radiation in the water wash circulation	-	5 hours

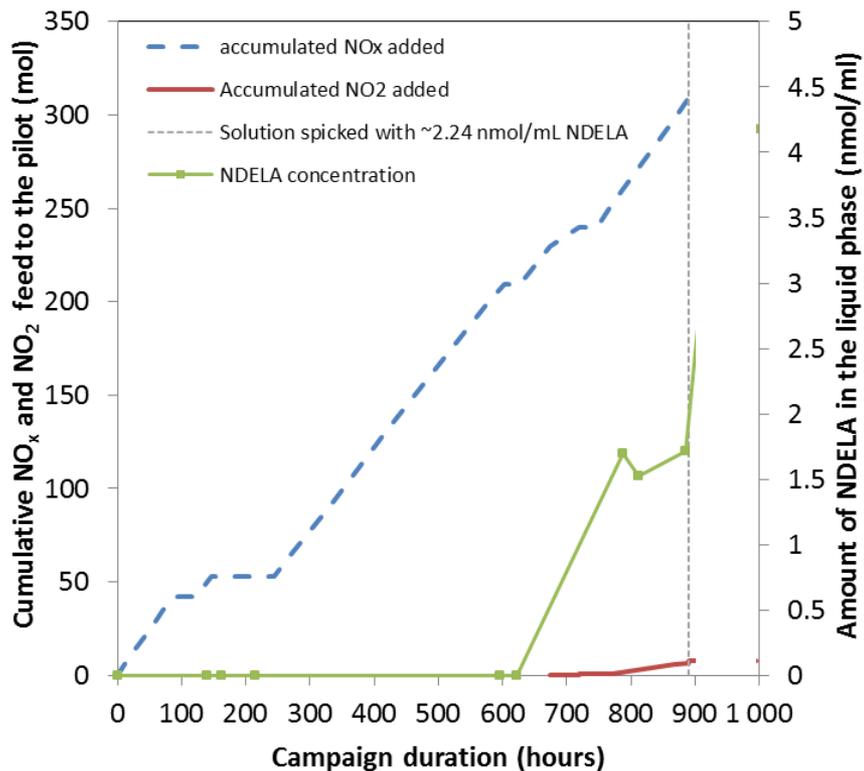
30 wt% MEA



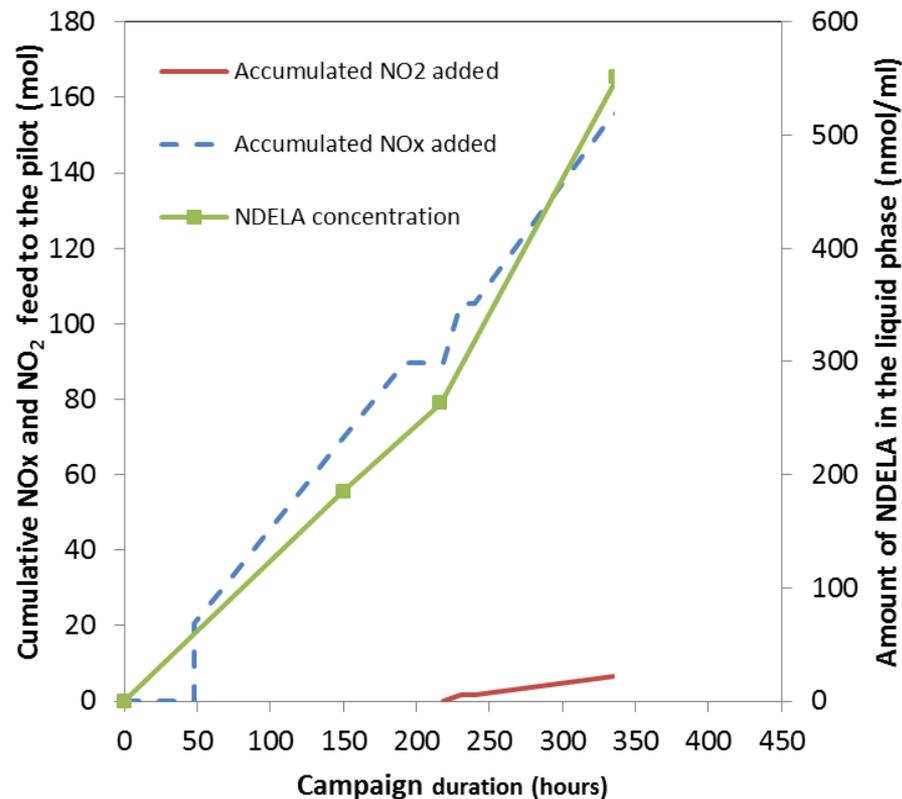
50wt% DEA



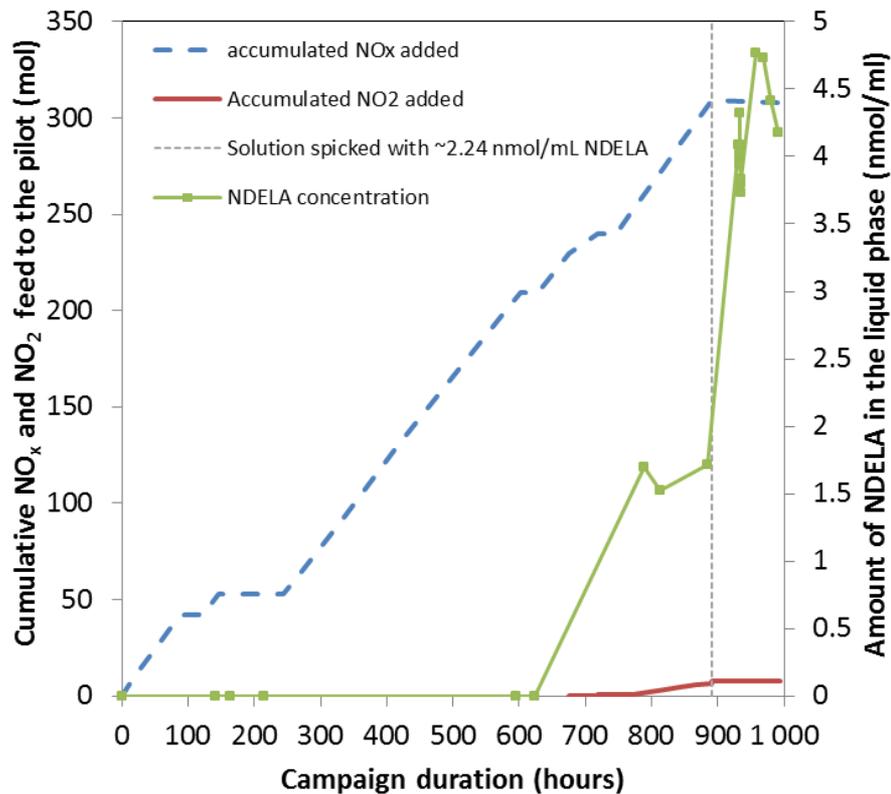
30 wt% MEA



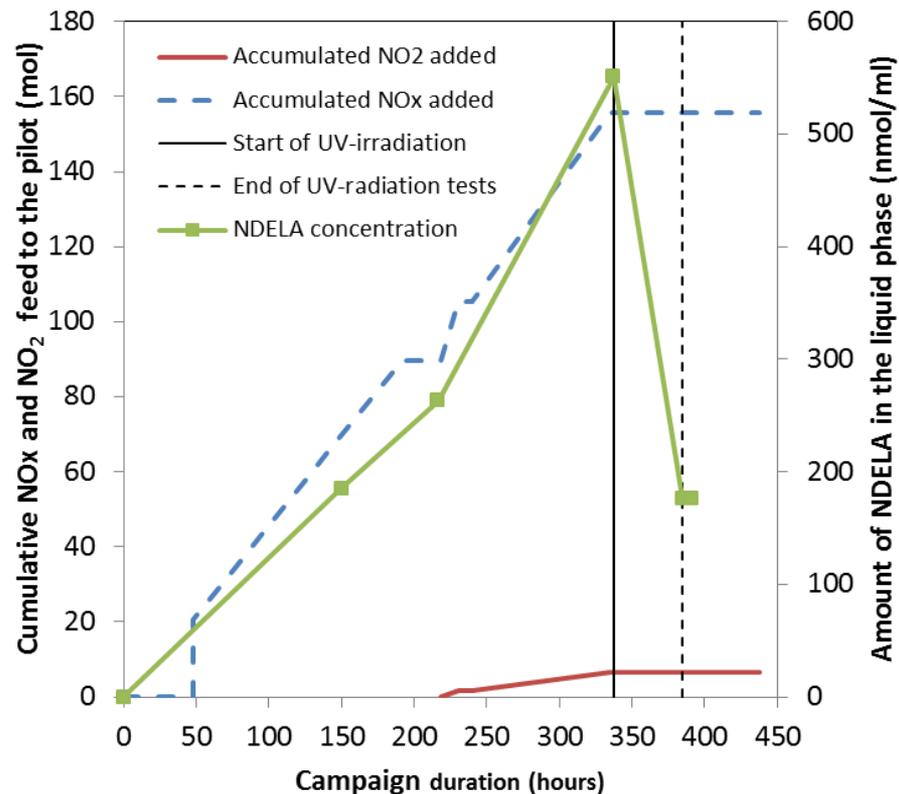
50wt% DEA



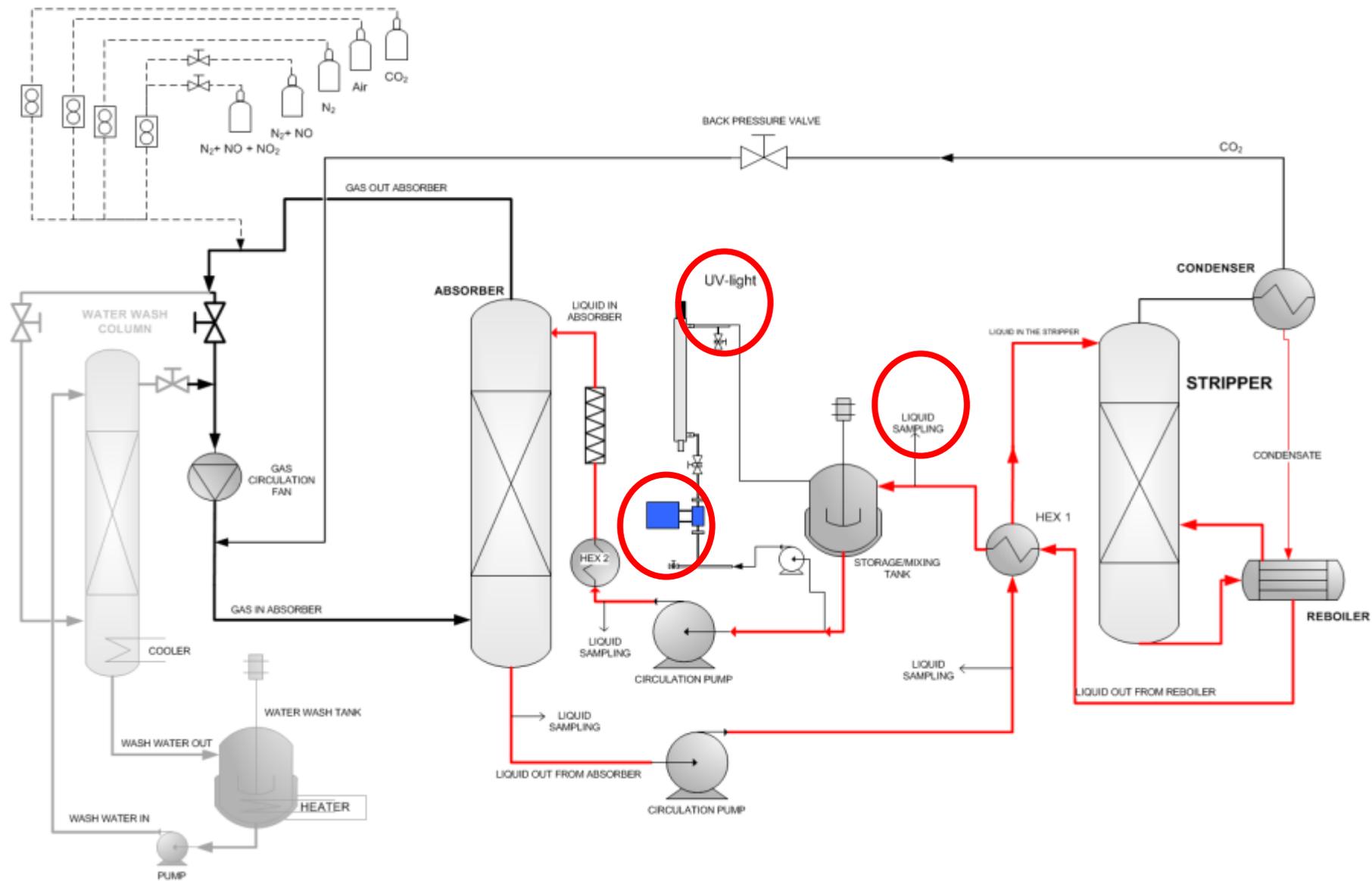
30 wt% MEA



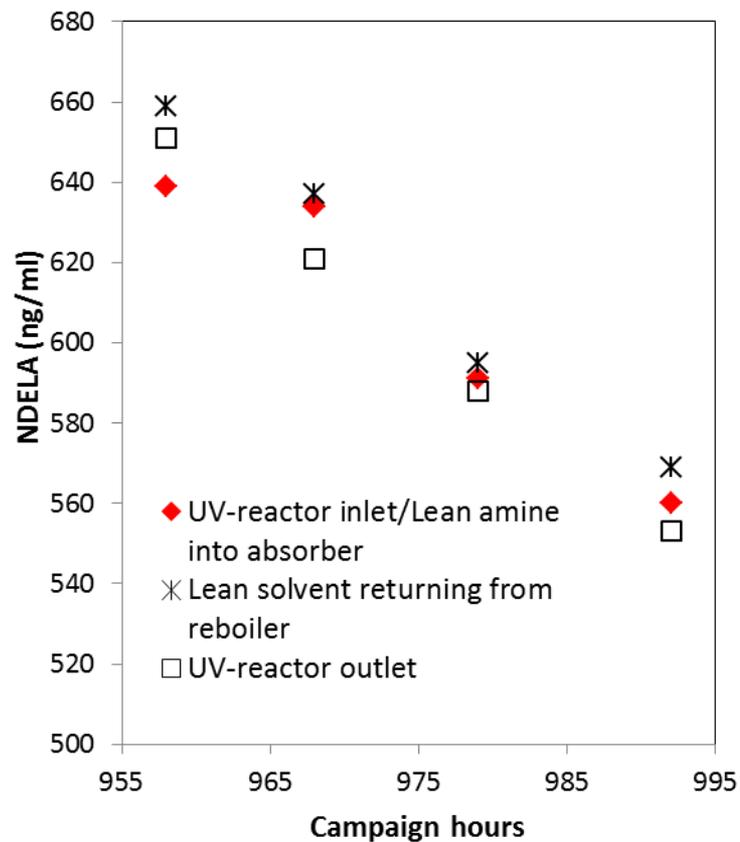
50wt% DEA



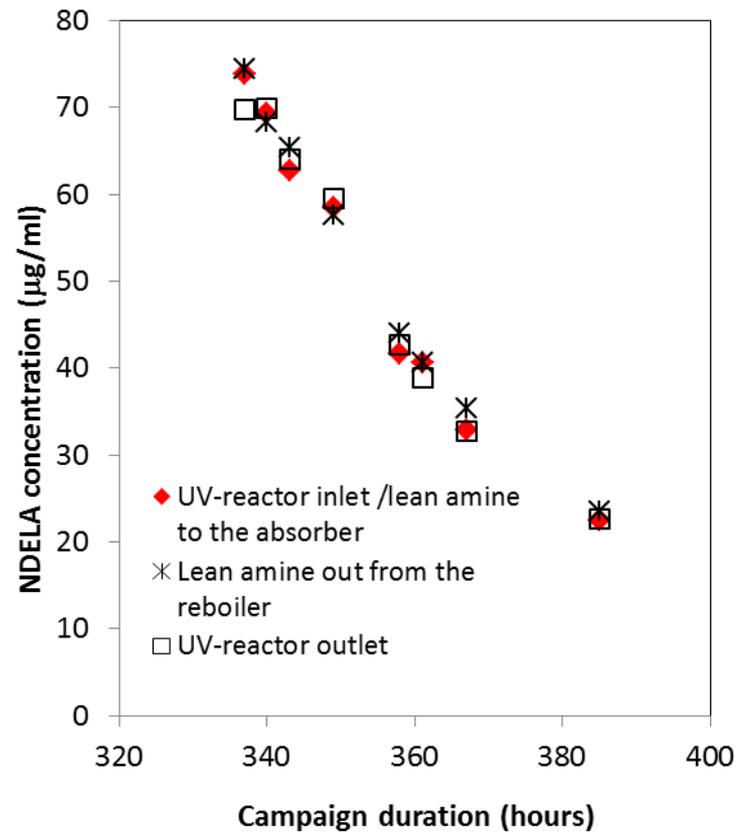
Results



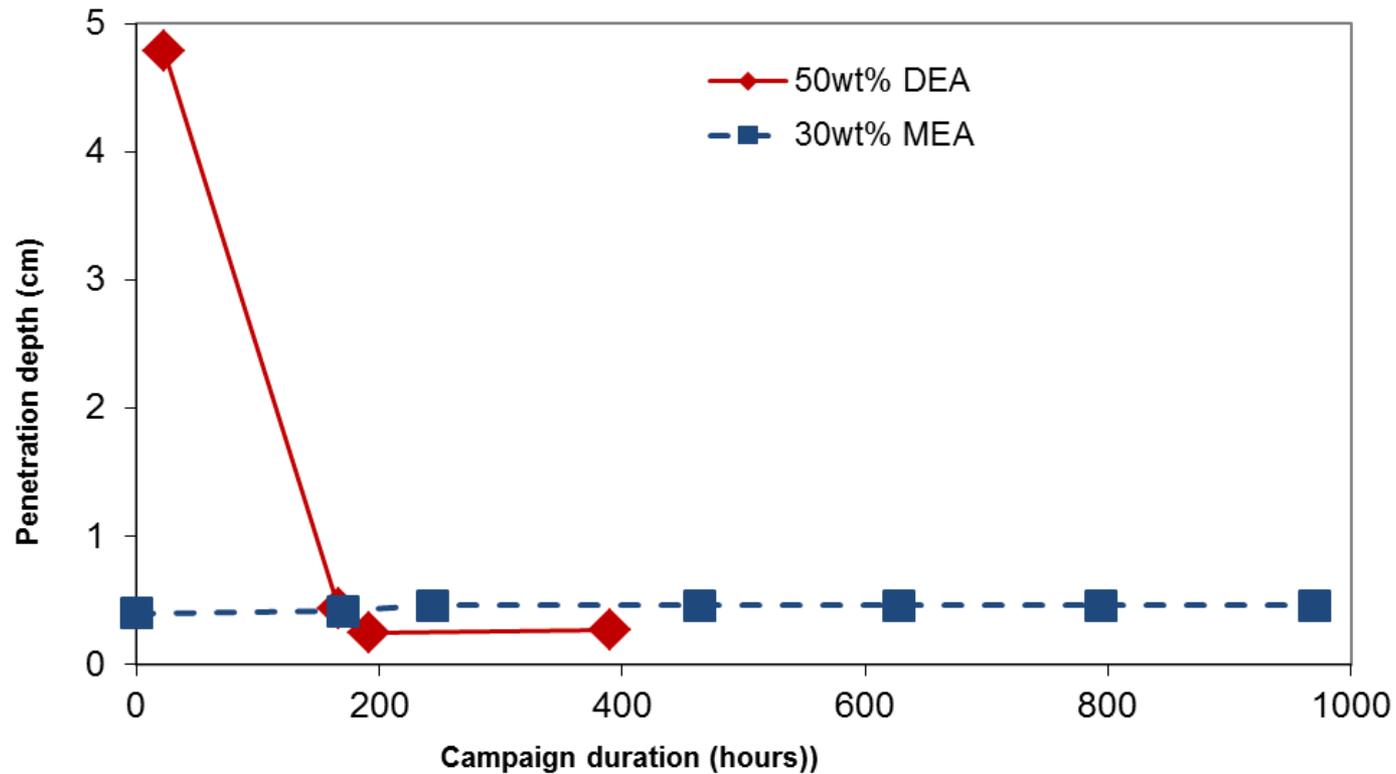
30 wt% MEA



50wt% DEA

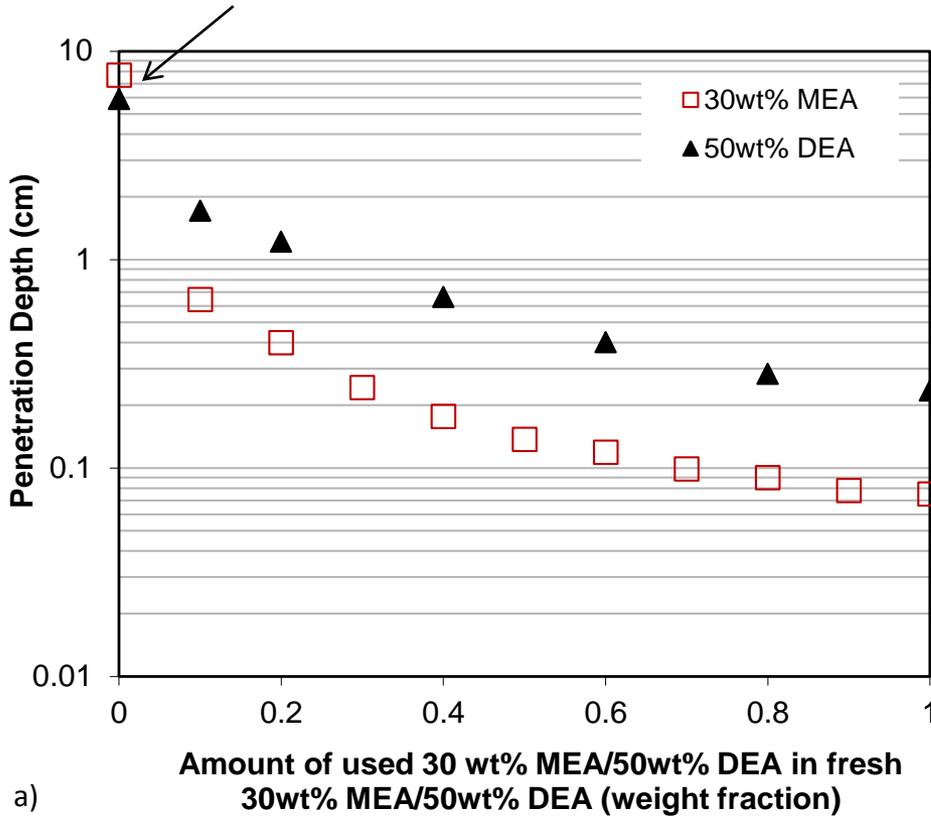


Penetration of UV-light



Effect of colour (degradation products)

Fresh amine solutions

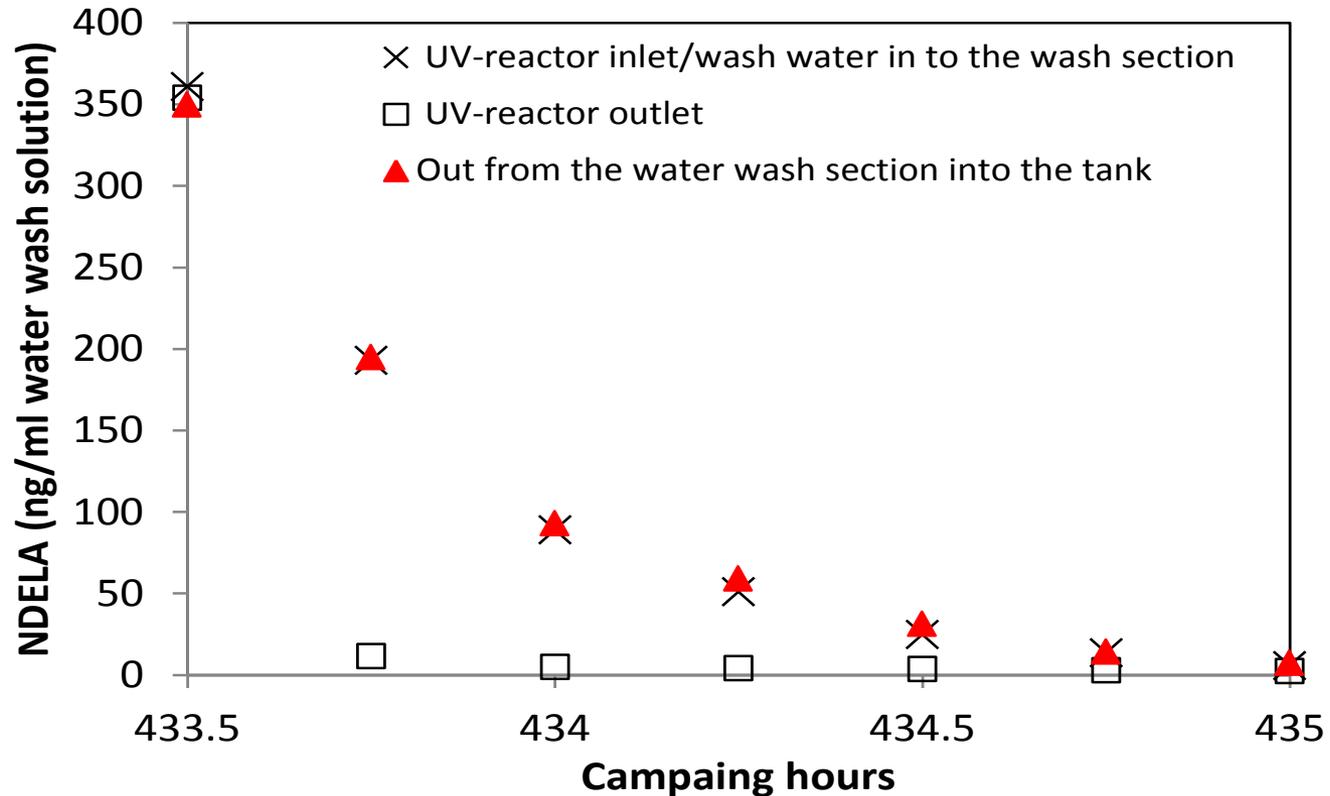


50wt% DEA used in a pilot for 410 hours.

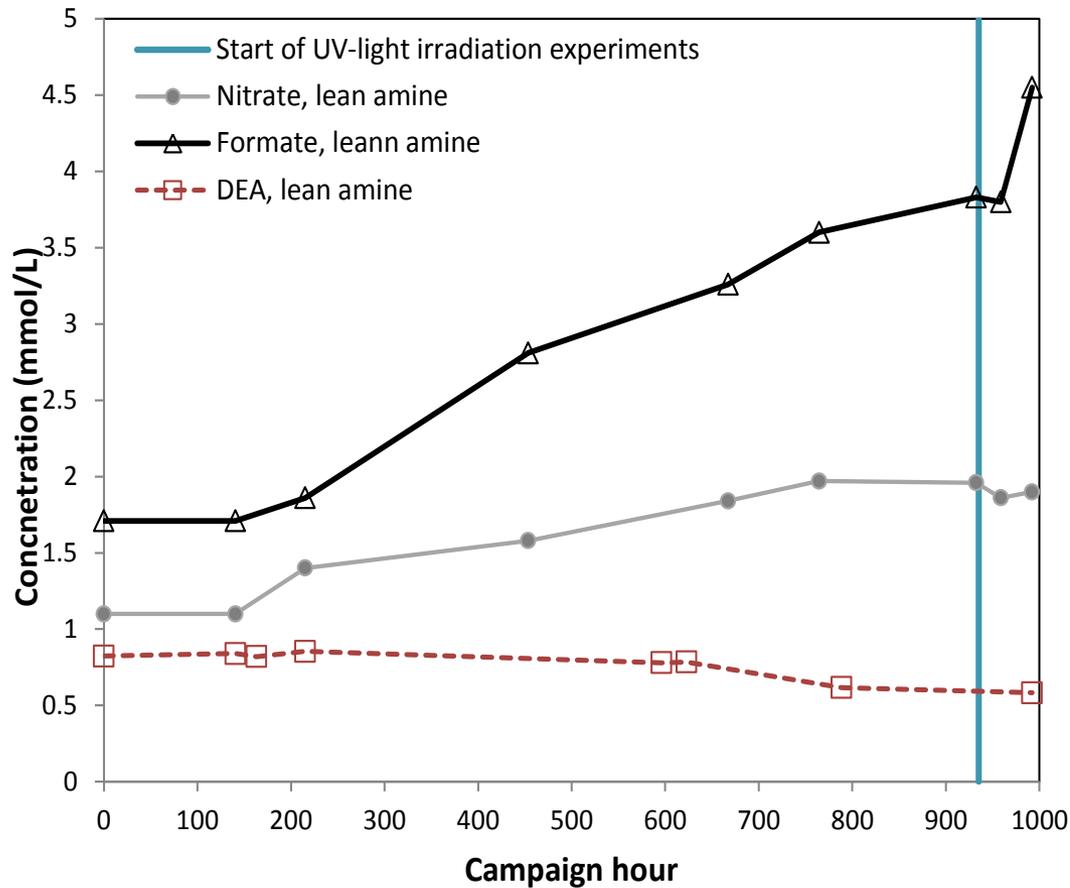
30wt% MEA used in a pilot for 1690 hours.



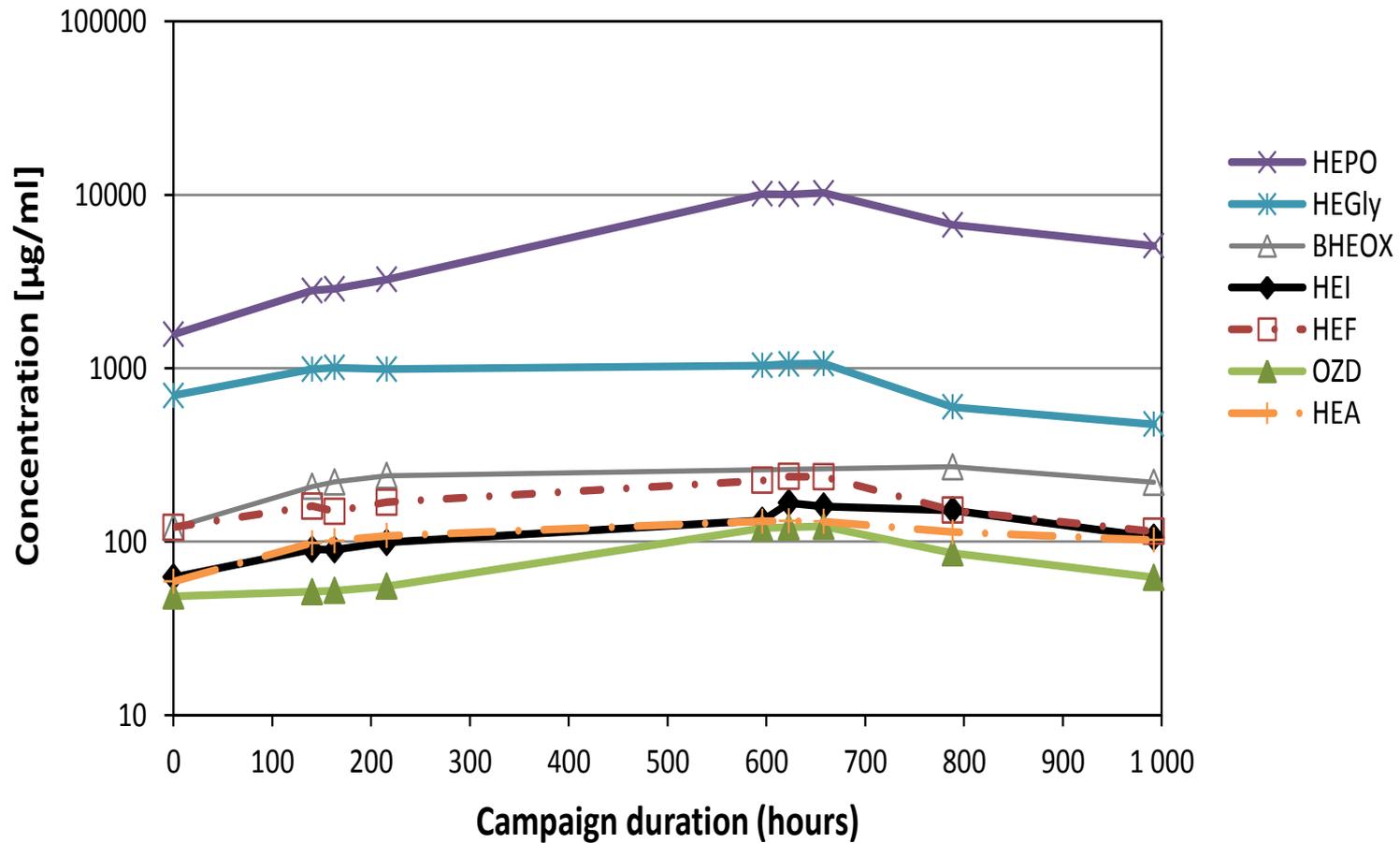
UV-light in the water wash



Degradation (30wt% MEA)



Degradation (30wt% MEA)



Conclusions

- the decomposition of NDELA decreases with increasing
 - colour of the solution
 - amine concentration
- To use UV-light in the main solvent loop would require an optimization of the UV-light reactor.
- Open questions:
 - UV-light and amine degradation
 - Influence of temperature



Thank you!

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