

## CONTINUUM-SOURCE CAVITY-ENHANCED OPTICAL FLUX MONITORING TO CONTROL THIN LAYER DEPOSITION PROCESSES

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### Introduction

Optical flux monitoring (OFM) sensors are promising for real-time growth monitoring[1-5]. However, they allow reaching the desired +/- 1% uncertainty (signal to noise ratio SNR = 100) only at high growth rates (Fig.1). Besides, they use unstable hollow cathode atomic lamps (HCL) as light source and separate optical channels for the signal (absorbed) and reference (non-absorbed) lines, leading to a strong tendency to drift.

### Methods

Our patented continuous-source cavity-enhanced OFM (CC-OFM) overcomes these limitations. It embeds an optical cavity to increase the light-vapor interaction length and boost the SNR, and a high-resolution modified echelle spectrometer that allows replacing the HCL by a continuous source, which makes additional reference lines unnecessary, providing superior stability and reproducibility.

### Results

Fig.1 summarizes CC-OFM performances (pink stars : results obtained in our reactor with added home-made OFM ports allowing little light to pass through, and circles : results extrapolated for standard 1" diameter OFM ports). The gain in SNR is huge (up to x17), enabling uncertainties better than +/- 1% down to few 10<sup>-2</sup> ML/s.

### Conclusion

These results demonstrate the potential of CC-OFM for real-time growth control. Work supported by ANR grant #ANR-21-CE24-0003

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