Cavity-enhanced optical flux monitoring for the growth of oxide materials.

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Thin film deposition by MBE is usually realised under the assumption that the material fluxes are constant within the deposition time. While it may be an acceptable assumption for some materials, it is not for others. In particular for oxide materials, the presence of oxygen in the MBE reactor causes the oxidation of the metals and therefore a variation of the emitted fluxes[1]. Regular re calibrations of the different fluxes are required, which is a tedious task and a source of uncertainty. Although numerous instrumental techniques are used to tackle this issue[2,3], there is a lack of a direct flux measurement technique that is both sensitive, selective and applicable in real-time. Optical flux monitoring is one of the promising techniques[4] and has been already turned into commercial products[5]. However, they cannot be operated at very low growth rate as the atomic absorption is too weak. By implementing an optical cavity within our MBE reactor, we were able to strongly increase the sensitivity of our OFM sensor[6]. In this contribution, we will detail the principle of operation of this sensor and the limitations to overcome to make it a practical powerful lab instrument.

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