

the porous films with respect to porosity, Al content and hydrophilicity. The next step in our study will focus on sensitivity enhancement and evaluations against other potentially interfering breath gases. We could observe from our preliminary experiments that the sensors show a measurable response to humidity. This can be attributed to a hydrophilic nature of the nanoporous film surface. However, this issue can potentially be resolved by applying a suitable humidity filter on the gas path [18] or by tailoring the surface hydrophobicity. With continuing developments on compact (on-chip) light sources and interrogation systems, this work demonstrates that subtly functionalized silicon photonic gas sensors show a high promise for portable and real-time sensing applications.

5. Conclusions

Selective gas detection on an optical chip is demonstrated taking advantage of surface functionalized nanoporous silica films on silicon microring resonators. Porous acidic aluminosilicate coatings obtained via deposition of nanoslabs and optionally modified via Atomic Layer Deposition of aluminum demonstrated selective, reversible and fast response to NH_3 and high selectivity with respect to CO_2 . Equilibrium response is achieved in less than 30 s and over 95% recovery within 90 s. A detection limit of 5ppm is estimated. A further improvement of the sensitivity could be achieved by optimizing the porosity and surface properties of the porous aluminosilicate films. This work demonstrates the high potential of on-chip optical gas sensors for ultra portable and low cost gas detection in a wide range of applications.

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