The direct integration of $Pb(Zr,Ti)O_3$ thin films : a pathway towards high-speed modulators

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Our digital world is growing at great speed implying the constant need for improving the network quality, broadening band widths allowing fast data traffic. **Electro-optic modulators** (see figure) are used in these state-of-the-art networks and are much faster than classic electrical switches. Tuned constructive and destructive interaction of light waves is achieved by **changing the refractive index** of the modulator material. **A ferroelectric material** as $Pb(Zr,Ti)O_3$ is often used in these kind of modulators. Up to now, epitaxial integration of the ferroelectric material is difficult because of the amorphous nature of the photonic platforms. Therefore, in this work we propose the **local epitaxial integration** with the **high-pockels coefficient** $Pb(Zr,Ti)O_3$ material for electro-optic modulation on state-of-the-art **SiN photonic platforms** by using the low-cost and efficient ink-jet printing technique. This deposition technique requires stable precursor solutions with appropriate rheological properties which allow the construction of a 2D electro-optic thin **$Pb(Zr,Ti)O_3$ layer pattern** on SiN platforms without the use of additional etching steps.