Research (What is it about?)	**Light-emitting phase of silicon**
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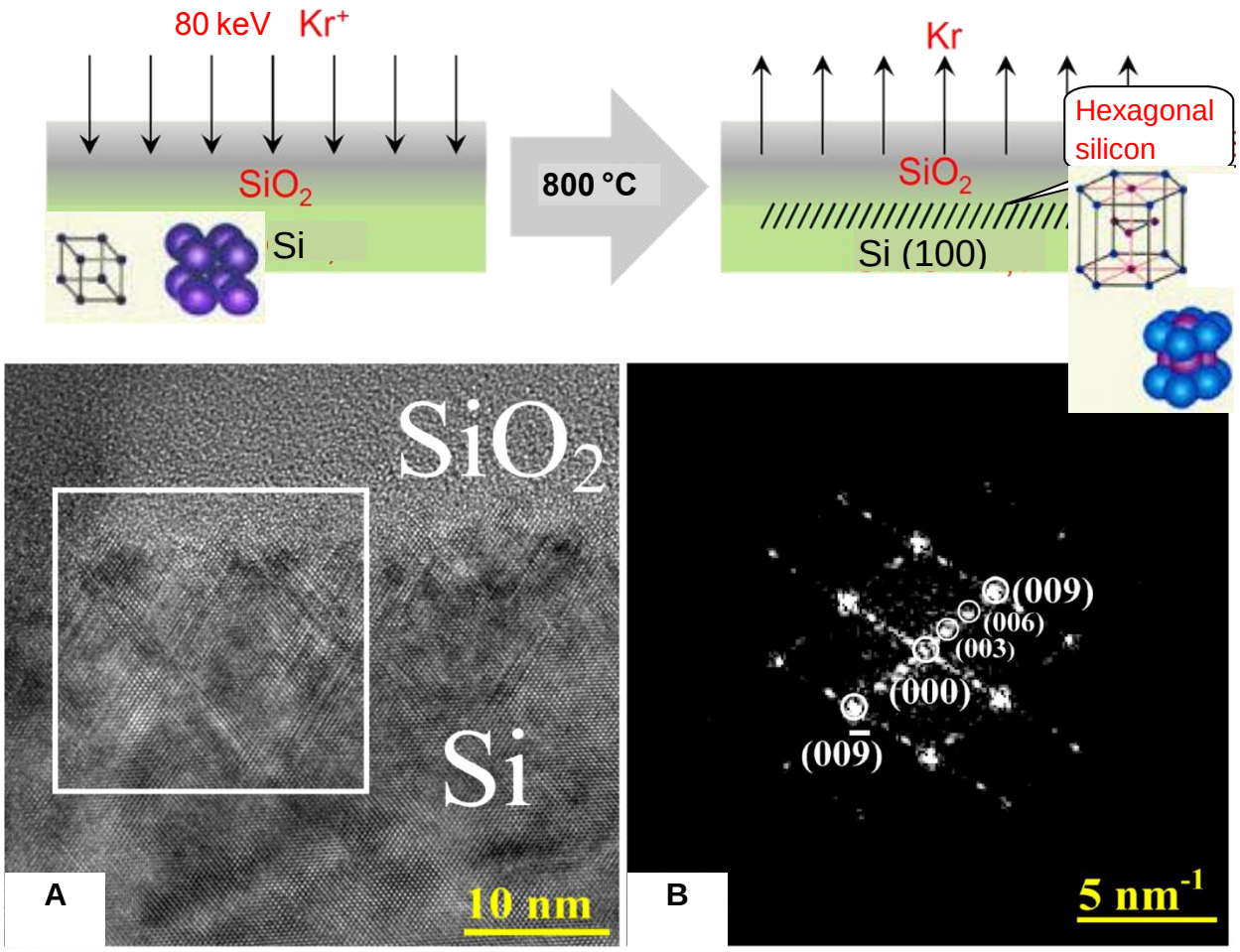
We find (The result)	Light-emitting layers of ***silicon*** were synthesized by ion implantation and by producing a ***hexagonal Si*** phase. It is predicted that the hexagonalization converts cubic *Ge* into a direct-gap semiconductor
Abstract	Silicon chips are the basis of modern processors. The limiting element for a more effective production of that silicon electronics are optical connections. For higher speed the transition to integrated fully optical circuits (***silicon photonics)*** is necessary. But usual silicon is not a light-emitting material due to indirect zone structure. The hexagonal structure of Si crystal is predicted to exhibit light-emitting properties. To obtain ***hexagonal silicon*** is a great challenge because it naturally crystallizes in the cubic structure. A method for producing hexagonal silicon is known but it is not compatible with complimentary metal-oxide semiconductor technology (CMOS) which is the basic one for modern silicon chips. We synthesize layers of hexagonal silicon by ion implantation into *SiO_2/Si* substrates. This technology is ***compatible with CMOS***. By using cross-sectional transmission electron microscopy, the formation of a hexagonal phase in a cubic silicon substrate near the interface with silicon dioxide under irradiation with Kr^+ ions (80 keV) and subsequent annealing at 800 °C is demonstrated. The synthesized layers are characterized by a low-temperature ***photoluminescence*** line with the maximum at a wavelength around 1240 nm. We calculated the electronic band structure of germanium and predicted that the hexagonalization converts cubic *Ge* into a direct-gap semiconductor with the bandgap of 0.48 eV.

Representative articles 2017-2018, quartiles	1. *Nikolskaya A.A., Korolev D.S., Mikhaylov A.N., Belov A.I., Sushkov A.A., Krivulin N.O., Muhamatchin K.R., Elizarova A.A., Marychev M.O., Konakov A.A., Tetelbaum D.I., Pavlov D.A.* Light-emitting 9R-Si phase formed by Kr^+ ion implantation into SiO_2/Si substrate. Appl. Phys. Letts. **113**(18): 182103 (2018).	Q1
	Q-index (Qi) for the result	**4**
	high blue	

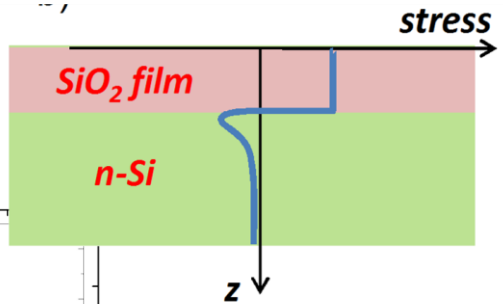
In collaboration	–

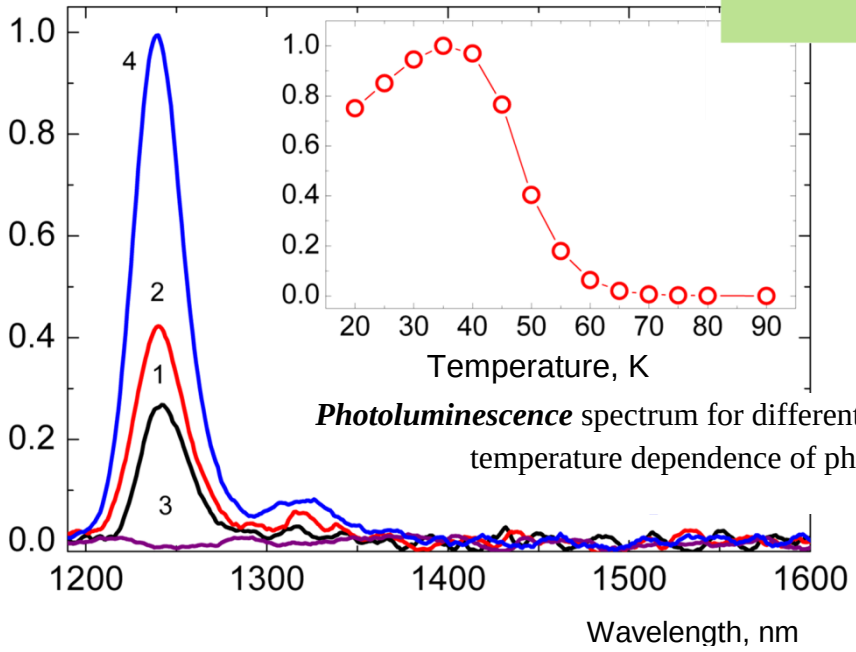


Transmission electron microscopy of Si sample after annealing at 800 °C.

Diffraction picture for square marked area in **A** proves the hexagonal structure formation.

Mechanical stress in SiO_2 film after annealing which forms the hexagonal phase of Si





Photoluminescence spectrum for different SiO_2 film thicknesses and temperature dependence of photoluminescence intensity.