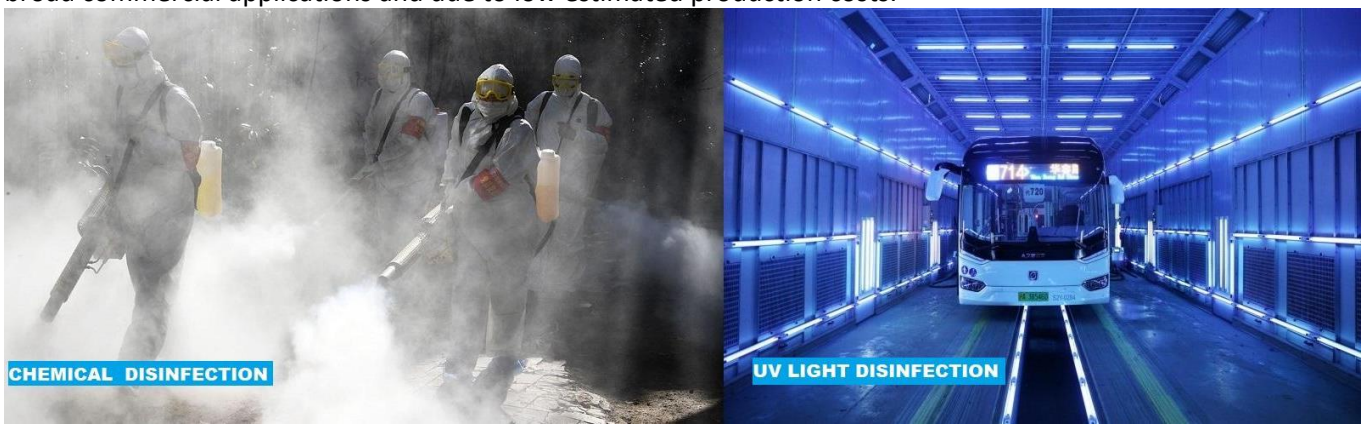
There are two commonly employed methods to sanitize and disinfect areas from bacteria and viruses — chemicals or ultraviolet radiation exposure. The UV radiation is in the 200 to 300 nanometer range and known to destroy the virus, making the virus incapable of reproducing and infecting. Widespread adoption of this efficient UV approach is much in demand during the current pandemic, but it requires UV radiation sources that emit sufficiently high doses of UV light. While devices with these high doses currently exist, the UV radiation source is typically an expensive mercury-containing gas discharge lamp, which requires high power, has a relatively short lifetime, and is bulky. The solution is to develop high-performance, UV light emitting diodes, which would be far more portable, long-lasting, energy efficient and environmentally benign. In the visible optical range, the market for semiconductor lasers and diodes is dominated by systems based on gallium nitride. However, these devices have too little quantum efficiency in the UV spectral range, hence UV systems based on Group III nitrides are not already wildly commercially available.

An interesting alternative to nitrides could be rocksalt phase ZnO/(MgZn)O/MgO layers and quantum structures (QS). As it was shown in preliminary results such layer and QS can be grown by using the molecular beam epitaxy (MBE) technique. The great advantage of such an approach is that cheap MgO substrates can be used. It is worth noting that using native substrates for homoepitaxial growth results in improving the quality of structures and their quantum efficiency. For commercial applications, the huge difference in the price between MgO and AlN substrates may also be significant. MgO crystals are about 40 times cheaper per square cm than AlN. **The epi-ready substrate prepared for epitaxy costs 22 USD, and AlN from Hexatech 975 USD.** This substrates price difference is fundamentally important for the future development of optoelectronics emitting in the far UV range. Moreover, MgO energy gap is 1.5 eV higher than in the case of AlN, which considerably extends the range of potential applications.

As part of the preparations for the project (*accepted for publication in Physical Review B-proof enclosed*), the following works were carried out:

- Theoretical calculations of band gap for rocksalt (MgZn)O alloys. The range where the direct gap coexists with the indirect gap was described.
- First RS-(MgZn)O layers and ZnO/ (MgZn)O/MgO quantum structures (QS) have been grown by MBE technique. The stability of rocksalt phase can be seen from the electron microscopy picture.
- Such QS emits light in deep UV range between 200-300 nm. This emission is somehow unexpected and occurred despite the fact that according to theoretical predictions RS-(MgZn)O layers with such composition should have an indirect band gap.

In our opinion, project implementation is interesting not only due to scientific reason but due to broad commercial applications and due to low estimated production costs.



Using ultraviolet light to disinfect public spaces is preferable to using harsh chemicals.

A popular scientific description of our work was published on 27.04.2020 in the Polish Science Portal – in Polish “Promieniowanie UVC przydatne w szybkiej dezynfekcji; fizycy pracują nad jego źródłami”