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Korea develops COVID-19 detection platform by 'slowing down light'

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Gwangju Institute of Science and Technology researchers detect coronavirus particles with Slow Light

A research group led by Professor Young Min Song of the Gwangju Institute of Science and Technology in Korea has recently developed a new technique to easily visualize viruses using an optical microscope. A recent study explains in detail the operating principle of their detection platform, called the "Gires–Tournois immunoassay platform" (GTIP).

The key element of GTIP is the Gires–Tournois "resonance structure," a film made from three stacked layers of specific materials that produce a peculiar optical phenomenon called "slow light." Because of how incident light rebounds inside the resonant layers before being reflected, the color of the platform seen through an optical microscope appears very uniform. However, nanometer-sized virus particles affect the resonance frequency of GTIP in their immediate vicinity by slowing down the light that gets reflected around them. The "slow light" manifests as a vivid color change in the reflected light so that, when viewed through the microscope, the virus particle clusters look like "islands" of a different color compared to the background.

To ensure that their system only detects coronavirus particles, the researchers coated the top layer of GTIP with antibody proteins specific to SARS-CoV-2. Interestingly, not only did the system enable the detection of viral particles, but, by using colorimetric analysis techniques, the researchers could even effectively quantify the number of virus particles present in different areas of a sample depending on the color of the light reflected locally.

Given that optical microscopes are available in most laboratories, the method developed by the group could become a valuable and ubiquitous diagnostic and virus research tool.