# Self-sanitizing Door Handle

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Door handles of public conveniences in hospitals, malls and schools show high incidence of contamination by various strains of bacteria and viruses. Our research has led us to create an effective self-disinfecting door handle designed to prevent transmission of harmful pathogens in public places. Our hypothesis is that a system of total internal reflection of UV light can be used inside a cylindrical transparent door handle coated in titanium dioxide (TiO2) to effectively and safely decompose pathogens. We first made a comparison of various suitable photocatalyst films and found that TiO2 was the most suitable material as it possesses a high bactericidal effect, a melting point over 500°C and is already safely used in products available to the general public. As photocatalyst film needs a consistent UV light source to perform its disinfecting function, which is produced by a special-designed generator: a UV light was mounted inside the handle powered by a self-charging dynamo activated every time someone opened the door. We then calculated if a total internal reflection system would be possible using a door handle coated with TiO2 using calculations according to Snell's Law of refraction. Silicon Dioxide (SiO2) was chosen to make the transparent handle using a sol-gel technique to bind the TiO2 coating onto the SiO2 handle. An experiment was conducted to test the effectiveness of the TiO2-UV system when compared with two other methods more commonly in use. We conclusively showed that the TiO2 –UV door handle kills E.coli bacteria 15.4 times more effectively than the current measures using the ordinary light sources as initiation. The results show the effectiveness of our door handle and the total reflection UV system as a public health measure for infection control.

**Awards Won:**