TRANSPARENT MICROSCALE ELECTRODES FORMED BY LASER-INDUCED METAL DEPOSITION ON GLASS FOR SMART WINDOWS APPLICATION

Dainius Balkauskas[1], Evaldas Kvietkauskas[1], Modestas Sadauskas[1], Viktorija Vrubliauskaitė[1], Romualdas Trusovas[1], Karolis Ratautas[1], Alexandr Belosludtsev[1]

[1]Center for Physical Sciences and Technology (FTMC)
dainius.balkauskas@ftmc.lt

Windows are part of any building architecture which lets the light in and creates connection with nature, surrounding environment. During sunny days, a lot of UV and infrared light comes into building. European Directive 2018/844 states that buildings are responsible for 36% of greenhouse gas emissions and that 50% of final energy consumption in the European Union is related to the use of heating, ventilation and air conditioning systems. Therefore, new technologies that can reduce energy consumption are necessary. Electrochromic materials have the unique property of changing the transmittance of light when an electric current is applied. Windows based on these materials will be able to dynamically regulate the entry of ultraviolet and infrared light into buildings, thus improving comfort and reducing energy costs. Transparent conductive electrodes are very import part of smart windows. We demonstrate a cost-efficient and large-scalable method of transparent microscale metal electrodes fabrication on a glass using laser-induced metal deposition technology. The novel electrodes are effective conductive layers, presenting a promising alternative to rare, brittle, and expensive Indium Tin Oxide (ITO). In our study, we discussed not only electrode formation technique, but also compared various electrodes' designs. Furthermore, the optimized copper electrode design was tested in a real multilayer smart window structure and proove that such electrodes can work with different electrochromic coatings.