# Streszczenie ENG

This thesis discusses the types of transparent electrodes and the methods of manufacturing them, along with possible applications, with particular emphasis on optoelectrical measurements. The first paper describes a method for manufacturing transparent electrodes using ultraprecise silver ink deposition techniques. The deposited 10 μm wide grid-shaped paths were used for contactless electroreflectance measurements of indium phosphide, a well-known material, in order to optimize the measurement setup. The second paper describes a technique for obtaining transparent electrodes using laser ablation to structure arbitrary shapes on the surface of a polymer layer and deposition of a metallic layer by physical vapor deposition. As a result of using the "laser lift-off" method, a silver and copper electrode in the shape of a mesh was obtained, and measurements were carried out on a van der Waals crystal. Contactless electroreflectance experiments were carried out in the optimized system, but also a new system for measuring thermoreflectance was shown, as the electrode found an application as a heater, and it was possible to modulate the sample reflection spectrum with temperature. The third paper describes a transparent electrode with a continuous conductive layer made of graphene. The synthesis and transfer of the graphene is described, followed by the measurements that were carried out using this electrode. Because of the continuity of the layer, it was possible to form a contact with the sample over its entire surface, and thus to carry out electroreflectance measurements in the so-called "soft contact" i.e., at the contact between the graphene and the van der Waals samples under study. With the electrode positioned at a minimum distance from the sample (on the order of tens of micrometers), surface photovoltage measurements were carried out, where it is crucial to collect the signal from the entire surface of the sample as it is illuminated. These results are also included in the published work. The fourth paper, meanwhile, addresses the typically occurring problem of polymer layer cracking by suggesting the use of cracking for unusual applications such as cryptography. The “crack-templated lift-off” method does not require the use of a laser system for structuring, as the process occurs spontaneously during cracking under the right conditions. The next step of applying the metallic layer and developing the pattern is the same as in the "laser lift-off" method. However, in this case, the result obtained is a transparent electrode with irregular shapes, which broadens the spectrum of potential applications of these electrodes for encryption.