Highlights

Activity B - Superconducting and correlated low dimensional materials and devices for quantum electronics and spintronics - 2021

Electric Transport in Gold-Covered Sodium-Alginate Free-Standing Foils

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The development of *innovative* and *green electronics* calls for the usage of recyclable and environmentally sustainable materials. We have realized flexible and transparent conducting films, by sputtering ultrathin gold nanometric layers on sodium-alginate free-standing films. Their electric transport properties have been investigated in temperature range *from 300 K to 3 K*. For a gold layer thickness higher than 5 nm, a typical metallic resistivity behavior is observed. Conversely, an unusual resistance temperature dependence is found for gold thickness of 4.5 nm. In this last case, above 70 K, the rapid polymeric expansion by lowering the temperature is considered to explain the observed behavior. In the low-temperature regime, below 70 K, a fluctuation-induced tunneling process is identified as the dominant transport mechanism at work. The reported results are complemented with the information extracted from structural, mechanical, and optical characterizations, and represent a base for future developments of *eco-friendly technologies*.

Fig. 1: Driven by the recent sustainability issues, a very hot field of research is the development of emergent and innovative *bio-materials*, such as sodium-alginate, useful for the realization of advanced devices for "*green electronics*".

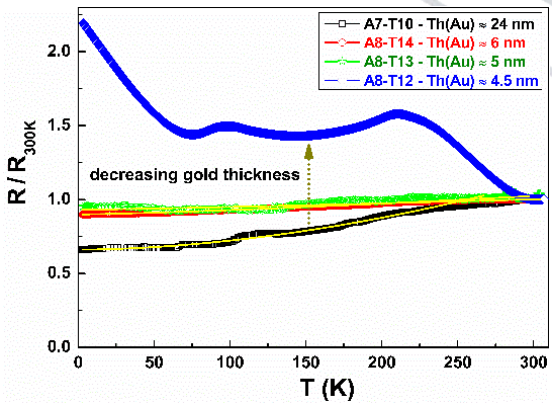

Fig. 2: A detailed characterization in temperature of the conduction mechanisms on alginate compounds is shown and is discussed in terms of different theoretical interpretations.