

Development of injectable composite hydrogels containing eutectic gallium–indium liquid metal and anti–cancer drug for photothermal and photodynamic treatment

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Liquid metal particles are widely used in bioengineering applications as well as soft electronics, batteries and sensors. Especially, eutectic gallium–indium alloy (EGaIn) has excellent chemical stability and biocompatibility, as compared with the conventional liquid metals such as mercury. Upon near infrared (NIR) radiation, the elevation of temperature as well as the formation of reactive oxygen species (ROS) leads EGaIn to be utilized in cancer treatment platform. In this study, a interpenetrating network (IPN) hydrogel with thiolated gelatin (GSH) and poly(ethylene glycol) diacrylate was used as an injectable reservoir for EGaIn mediated multiple anti–cancer treatments: (1) photothermal effect by temperature, (2) photodynamic effect by ROS, and (3) additional delivery of anti–cancer drug 6–mercaptopurine (6–MP). 6–MP was chemically attached to GSH via disulfide bond and its release profile could be regulated by NIR laser radiation. Therefore, our injectable IPN hydrogel platform containing EGaIn liquid metal and chemical drug could be applied to a multi–functional anticancer therapy.