Electronic supplementary information

Preparation of near-infrared laser responsive hydrogels with enhanced laser marking performance

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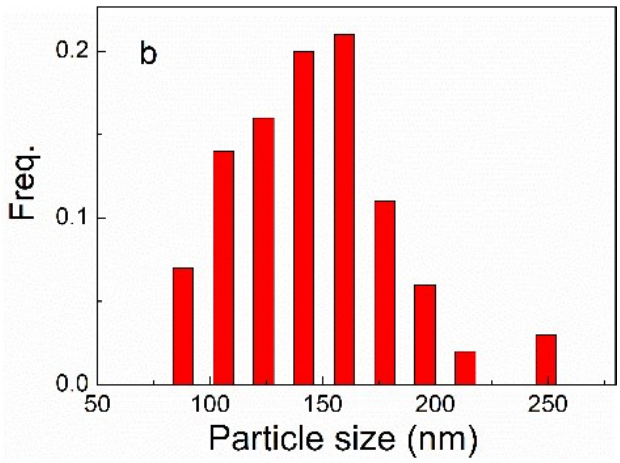

Figure S1. The particle size distribution of the Bi_2O_3 particles.

In order to quantify the laser marking performance of PAM/PS@Bi_2O_3 hydrogels, the color differences are introduced using CIE L*a*b* coordinates in our revised manuscript. Color difference can be defined as the numerical comparison of a sample's color to the standard. It indicates the differences in absolute color coordinates and is referred to as Delta (Δ). These formulas calculate the difference between two colors to identify inconsistencies.

Defined by the Commission Internationale de l'Eclairage (CIE), the L*a*b* color space was modeled after a color-opponent theory stating that two colors cannot be red and green at the same time or yellow and blue at the same time. As shown in the equation below, L indicates lightness, a is the red/green coordinate, and b is the yellow/blue coordinate. These values of PAM/PS@Bi_2O_3 hydrogels before and after laser irradiation can be performed using an X-Rite 7000A spectrometer (X-Rite, USA). Before laser marking, these values can be recorded as L_0, a_0, b_0. After laser marking, these values can be recorded as L_1,a_1, b_1. Deltas for L (ΔL), a (Δa) and b (Δb) may be positive (+) or negative (-). The total difference, Delta E (ΔE*), however, is always positive.

$$\Delta E = \sqrt{\Delta L^2 + \Delta a^2 + \Delta b^2} \qquad (1)$$

ΔE was used to determine the laser marking performance of hydrogels before and after laser marking. The larger the value ofΔE, the more obvious the marking contrast.

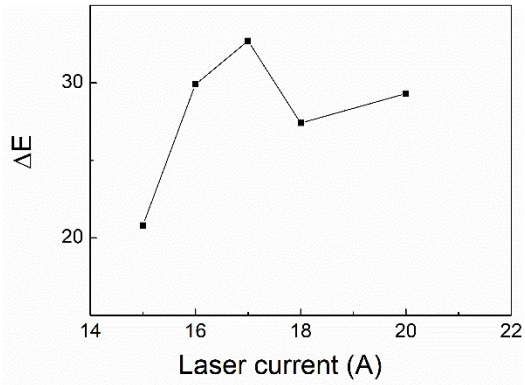

Figure S2. The ΔE values of the laser marked PAM/PS@Bi_2O_3 hydrogels at different laser current.

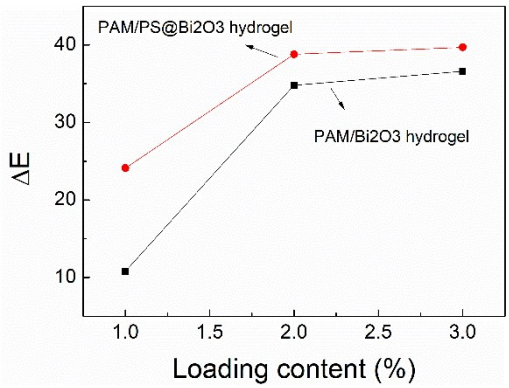

Figure S3. The ΔE values of the laser marked PAM/Bi_2O_3 and PAM/PS@Bi_2O_3 hydrogels at different loading content of laser sensitive particles.

Table S1. Characteristic TGA data of the pure hydrogel, PAM/2%PS@Bi_2O_3 hydrogel samples before and after laser marking.

Samples	Temperature for 5% weight loss $T_{5\%}$ (°C)	Temperature for the maximum degradation peak T_{max} (°C)
Unmarked PAM/PS@Bi_2O_3	181.5	390.0
Laser marked PAM/PS@Bi_2O_3	104.0	383.9