

Chemical and physical characterization of selected self-adhesive hydrogels used in the treatment of thermal burns

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The purpose of dressings, especially hydrogel ones, is to support the wound healing process by creating ideal moist conditions, protection against infection, and acceleration of tissue regeneration.

Hydrogel dressings have unique properties that make them particularly effective in the treatment of various types of wounds, including burns, pressure sores, chronic wounds and ulcers.



Water absorption measurement

Absorption was measured by weighing water-saturated samples after gently removing excess water from the dressing surface with a paper towel. Samples were soaked for 30 minutes, 2 hours, 24 hours, 48 hours and 72 hours in distilled water and at 22.9°C.

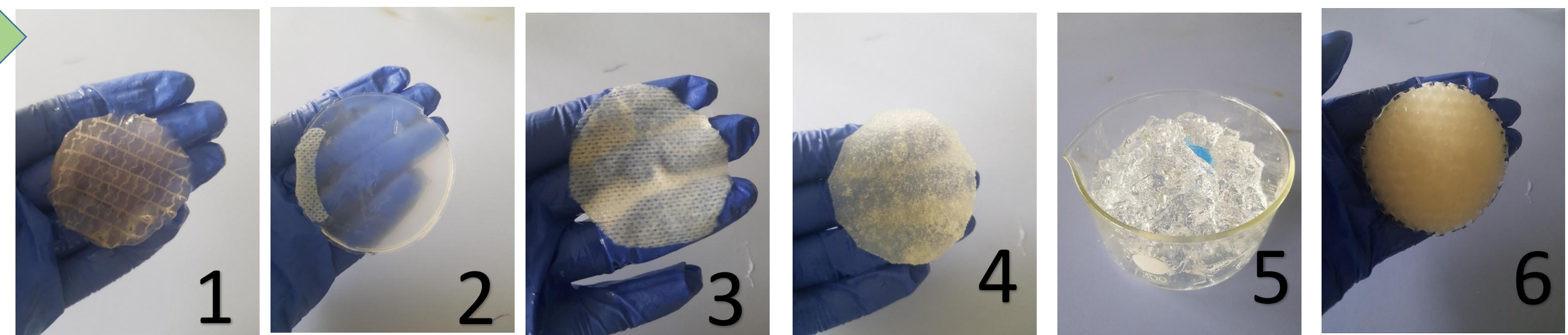


Table 1. Swelling degree of hydrogels

	1 AC	2 AG	3 IC	4 BS	5 SG	6 HT
30 min	141282,1%	1480,1%	15217,4%	2914,5%	296116,5%	54663,4%
2h	157435,9%	3590,7%	16376,8%	3490,4%	548576,1%	66930,7%
4h	175897,4%	9716,9%	17971,0%	3839,4%	597540,5%	70247,5%
48 h	181538,5%	12226,5%	18695,7%	3926,7%	597961,2%	72821,8%
72 h	198461,5%	13925,4%	18840,6%	3944,2%	598835,0%	73019,8%

DSC thermograms for samples 1-6, respectively

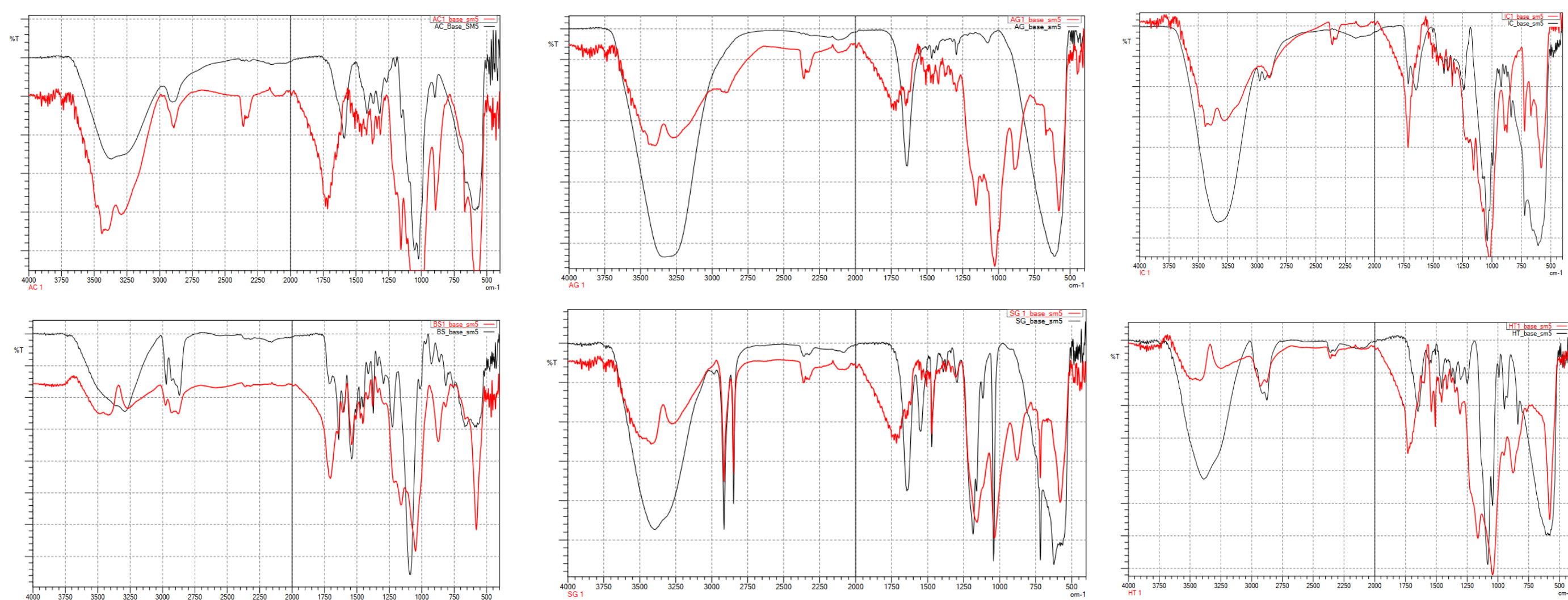
Differential Scanning Calorimetry – DSC

DSC studies of hydrogel dressings confirm that these materials can undergo a number of thermal transformations. In the temperature range of 90–120°C, processes related to the glass transition of hydrogels based on polyvinylpyrrolidone and polyethylene are often observed. The presence of medicinal substances in hydrogel dressings can significantly affect the changes in the thermal characteristics of the material.

Fourier Transform Infrared Spectroscopy– FTIR

FTIR examination of all six dressings showed the presence of characteristic absorbance bands, confirming the presence of specific functional groups in their structure. All samples showed bands at 3350 cm^{-1} (O-H stretching bands), 2880 cm^{-1} (C-H stretching bands), 1618 cm^{-1} (C=O stretching bands), 1410 cm^{-1} (C=C stretching bands), 1100 cm^{-1} (C-O stretching bands) and 1017 cm^{-1} (C-O-C stretching bands).

FTIR spectra for samples 1-6, respectively



SEM for samples 1-6 respectively

Scanning electron microscopy -SEM

The dressings have a diverse structure, including a porous structure (4, 6), a fibrous structure (1, 3) and a homogeneous structure with visible inclusions (2 and 5). The porous structure promotes effective liquid absorption and ensures good air permeability. The fibrous structure gives the sample unique properties, combining flexibility with good liquid retention capacity.

