EuroSciCon

8th International Conference on

Smart Materials and Structures

August 01-02, 2019
Dublin, Ireland

Sonia Norouzi Esfahany et al., Nano Res Appl 2019, Volume 05

Tunning switch temperature of shape memory polyacrylamide hydrogel

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In this work, chemically cross-linked polyacrylamide (PAAm) hydrogel prepared by free radical polymeriztion. The effect of water content on glass tarnsition temperature (Tg) of hydrogel, as switch temperature of shape memory system, was investigated using dynamic mechanical analysis (DMA). The transition temperature, i.e. the desired switch temperature for our work, was chosen around ~ 30°C by tunning the water content of hydrogel at 25%, Fig. 1. Shape memory behaviour of chosen hydrogel was investigated for a full cycle, i.e. four steps, by DMA. The four steps procedure performed at a constant heating/cooling rate of 5°C.min-1. First, the sample was heated to 50°C (above the switch temperature) and stretched to a certain strain (ε) under a constant force (Step 1). Then, the deformed sample was cooled to -50°C under the fixed force (Step 2). The force then removed and the temporary strain was measured (Step 3). Finally, the sample was reheated to 50°C and kept for 50 min in this temperature, then the recovery strain recorded (Step 4). The shape fixing ratio and shape recovery ratio as the main characteristics of shape memory polymeric system calculated from Fig. 2. The results indicated that the shape fixing ratio and shape recovery ratio of the system were 96% and 78%, respectively. Recovering to orginal shape was started around 10°C. The sample showed good shape fixity because of existence the hydrogen bonds between PAAm and water. Hydrogen bonds as physical cross linkers could improve structural strength of the sample.

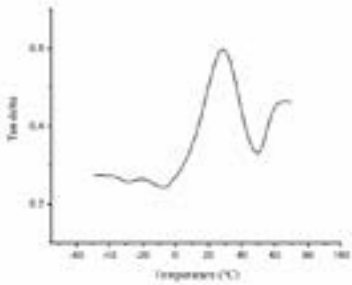

Fig 1. DMA curve PAAm with 25% water.

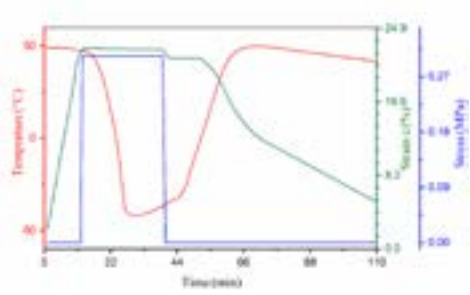

Fig 2. Shape memory behavior of PAAm with 25% water.

Biography

Miss S. Norouzi Esfahany has just completed her MSc from Tarbiat Modares University. This article is a portion of her MSc thesis.

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