

材料化学工程与纳米技术

## 亲水-疏水PVP-semi-IPN-PCL水凝胶的制备与溶胀性能

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摘要

N-乙烯基吡咯烷酮 (NVP) 在聚己内酯 (PCL) 的乙酸乙酯溶液中进行自由基聚合, 制备了亲水-疏水性聚乙烯吡咯烷酮 (PVP) / 聚己内酯 (PCL) 半互穿网络水凝胶 (PVP-semi-IPN-PCL)。凝胶中PCL的熔融温度  $T_m$  无明显变化, 而  $T_m$  吸热峰形状随PVP含量变化。凝胶平衡溶胀率 (ESR) 随PVP含量的升高而增大, 结合水量的增大尤其显著。由于“笼蔽效应”, 低浓度引发剂时, 偶氮二异丁腈 (AIBN) 引发制备的凝胶ESR低于过氧化苯甲酰 (BPO) 引发剂。交联剂浓度较低时, 以戊二醛交联形成凝胶的ESR较 N, N-亚甲基双丙烯酰胺 (NMBA) 交联形成的凝胶大。浓度较高时, 戊二醛交联凝胶ESR较NMBA低。PVP含量 (质量) 分别为20%、40%、60%、80%时, 凝胶溶胀动力学Fick模型中的  $n$  值分别为0.854、0.471、0.466、0.253, 说明在合适的PVP含量时, 凝胶的溶胀动力学符合Fick模型。

关键词 [PVP-semi-IPN-PCL水凝胶](#) [亲水-疏水](#) [溶胀性能](#) [Fick模型](#) [结合水](#)

分类号

## Preparation and swelling properties of hydrophilic-hydrophobic PVP-semi-IPN-PCL hydrogels

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### Abstract

Hydrophilic hydrophobic polyvinylpyrrolidone (PVP) semi IPN polycaprolactone (PCL) hydrogels were prepared through free radical polymerization of N-vinyl pyrrolidone (NVP) in ethyl acetate. The melting temperature  $T_m$  kept unchanged and that was resulted from the formation of PVP-semi-IPN-PCL. The influences of some factors, such as PVP content, initiator and crosslinking agent on the swelling properties of hydrogels were investigated. It was found that the equilibrium swelling ratio (ESR) of hydrogels increased and the bond water content in hydrogels increased with increasing PVP content. Because of cage effect, the ESR of hydrogel with azodiisobutyronitrile (AIBN) as initiator was lower than that initiated by benzoyl peroxide (BPO) at a low initiator concentration. As compared with NMBA crosslinking agent, hydrogels with glutaric dialdehyde (GDA) as crosslinking agent had a higher ESR at a lower concentration while had a lower ESR at a higher concentration. The swelling kinetics of hydrogels were discussed with the Fick model and  $n$  value calculated were 0.854, 0.471, 0.466, 0.253 with PVP content (mass) 20%, 40%, 60%, 80%, respectively. It could be concluded that the swelling properties of hydrogels fit the Fick model well at a proper PVP content.

**Key words** [PVP-semi-IPN-PCL hydrogel](#) [hydrophilic/hydrophobic](#) [swelling property](#) [Fick model](#) [bonding water](#)

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