

研究论文

低浓度HPAM/AICit交联体系的²⁷Al NMR研究

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摘要 用²⁷Al NMR谱研究了高分子量低浓度的部分水解聚丙烯酰胺(HPAM)与柠檬酸铝(AICit)体系交联反应过程中Al的化学位移和Al的自旋-晶格弛豫时间的变化. 结果表明, HPAM与AICit反应后, 与HPAM分子链上的羧基发生配位交联的Al的化学位移向低场移动, 而不参与交联反应的AICit分子结构中Al的化学位移基本不变.

HPAM/AICit交联体系中存在三种形态的Al, 分别对应三种不同的自旋-晶格弛豫时间. 当HPAM的质量浓度 ≤ 200 mg/L时, HPAM与AICit反应过程中交联态Al的自旋-晶格弛豫时间 τ_{13} 随反应进行变小, HPAM与AICit主要发生分子内交联反应. 当HPAM的质量浓度 ≥ 250 mg/L时, HPAM与AICit反应过程中交联态Al的自旋-晶格弛豫时间 τ_{13} 随反应进行变大, HPAM与AICit主要发生分子间交联反应.

关键词 [部分水解聚丙烯酰胺](#) [柠檬酸铝](#) [自旋-晶格弛豫时间](#) [交联体系](#) [化学位移](#)

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²⁷Al NMR Studies on HPAM/AICit Crosslinking System with Low Concentration Polymer

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Abstract The change of the chemical shift and the spin-lattice relaxation time of Al in the reaction process of partially hydrolyzed polyacrylamide(HPAM) with a low concentration and high molecular weight and aluminum citrate(AICit) system are investigated *via* ²⁷Al NMR measurement. The experimental results show that after crosslinking the chemical shift of Al which crosslinked with the carboxyl of HPAM increased, but the chemical shift of Al which didn't react with HPAM almost kept the same. There are three phases of aluminum in the HPAM/AICit crosslinking system. These three phases of aluminum correspond to three different spin-lattice relaxation time of Al. When the concentration of HPAM is less than or equal to 200 mg/L, the spin-lattice relaxation time(τ_{13}) of Al was decreased with the increase of reaction time after crosslinking, the linked polymer solution was formed mostly by intra-molecular crosslinking reaction between HPAM and AICit when the concentration of HPAM was more than or equal to 250 mg/L, the spin-lattice relaxation time(τ_{13}) of Al was increased with the increase of reaction time after crosslinking, the linked polymer solution was formed mostly by inter-molecular crosslinking reaction between HPAM and AICit.

Key words [Partially hydrolyzed polyacrylamide](#); [Aluminum citrate](#); [Spin-lattice relaxation time](#); [Crosslinking system](#); [Chemical shift](#)

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