

论文

## 离子键交联的聚两性电解质凝胶在不同pH和不同电解质溶液中溶胀行为研究

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**摘要** 以丙烯酸(AA)和甲基丙烯酸二乙氨基乙酯(DEAM)形成的离子复合物与丙烯酰胺(AAm)共聚,合成了一种新型的离子键交联的聚两性电解质凝胶(PADA).由于分子之间的氢键作用,PADA凝胶并不是在A/C(负正离子单体摩尔比)为1,而是在A/C为1.55处有最大消溶胀.与共价键交联的聚两性电解质凝胶相比,PADA凝胶的溶胀行为具有更强的pH敏感性.PADA凝胶在不同pH缓冲溶液中的溶胀行为表明,在pH 3~4之间消溶胀程度最大.在偏离该pH区域时凝胶均发生溶胀.但凝胶的溶胀程度在pH<3的酸性溶液中随A/C的增加而降低;而在pH>4的偏碱性溶液中随其增加而增加.在不同价数的离子溶液中,离子浓度对于PADA凝胶的平衡溶胀有着不同的影响.对于一价的NaCl溶液,PADA凝胶有典型的反聚电解质效应.但对于高价的CaCl<sub>2</sub>和柠檬酸三钠溶液,只在较低的浓度下,才表现出反聚电解质效应.而在较高盐浓度时,随盐浓度的增加其溶胀比反而降低.这可能与高价离子形成的离子键交联有关.与pH对PADA凝胶溶胀程度的影响相似,在CaCl<sub>2</sub>溶液中,PADA凝胶的溶胀程度随A/C的增加而降低;而在柠檬酸三钠溶液中则刚好相反.这种独特的溶胀行为似乎与高价离子电荷的正负性有关.

**关键词** [离子键交联](#) [聚两性电解质凝胶](#) [溶胀行为](#)

分类号

## STUDY OF SWELLING BEHAVIOR FOR IONICALLY CROSSLINKED POLYAMPHOLYTE HYDROGELS IN SOLUTIONS WITH VARIOUS pH AND ELECTROLYTES

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**Abstract** A series of polyampholyte hydrogels were prepared by free radical aqueous copolymerization of ionic complex of acrylic acid and(*N,N*-diethylamino)ethyl methacrylate and acrylamide(PADA gels). Owing to the hydrogen bonding interaction among acrylic acid molecules,PADA hydrogels in water had the maximum deswelling when the molar ratio of anionic and cationic monomers (A / C)was 1.55,but not 1.0 as ordinary. By comparison with covalently crosslinked polyampholyte hydrogels,PADA gels were mole pH sensitive in swelling behavior. The swelling experiments indicated that PADA gels deswelled in buffer solutions of pH 3—4,but swelled when the pH deviated from this pH range. Furthermore,the swelling degree of PADA gels decreased with an increase of A / C in buffer solutions of pH value below 3 and increased in the buffer solutions of pH value higher than 4. The ion strength greatly influenced the equilibrium swelling ratio of PADA gels in the solutions of salts with varied valences. PADA gels exhibited typical antipolyelectrolyte effect in univalent NaCl solutions. In multivalent CaCl<sub>2</sub> and trisodium citrate (TSC) solutions,however,PADA gels also exhibited antipolyelectrolyte effect only in lower concentrations of salt. In salt solutions with higher concentration,the swelling ratios of PADA gels decreased with the increment of concentration. This might be attributed to the ionic crosslinkage formed by multivalent ions. Similar to the influence of pH on the swelling degree of PADA gels,the swelling ratios of PADA gels decreased in CaCl<sub>2</sub> solutions with the increment of A / C,whereas,increased in TSC solutions with the increment of A / C. The unique behavior seems to be related to the charge characteristics of multivalent ions.

**Key words** [Ionic crosslinkage](#) [Polyampholyte gel](#) [Swelling behavior](#)

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