

高酸度电解质溶液中硅酸的形态 及其聚合动力学研究

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在核燃料后处理的水法工艺中,通常用萃取法和离子交换法回收铀、钚等放射性元素。为抑制萃取过程中的乳化和界面污物的形成以及离子交换中的树脂中毒,料液必需先经除硅处理。本工作结合实际任务,对高酸度硅含量较低的电解质溶液中硅的形态及其聚合动力学进行了研究。

对硅含量为150mg/l和100mg/l的各三种不同酸度的电解质溶液,经不同加热处理,以及加入不同的絮凝剂后,测定了硅酸的形态及其转化。结果表明:酸度越高、加热温度越高、加热时间越长越有利于硅酸的聚合。聚醚有絮凝中聚硅酸的能力,除硅效果比白明胶好,且抗辐照性能亦较强。温度对聚醚絮凝除硅的影响甚小,而对白明胶影响显著。低聚硅酸的聚合动力学规律可近似为三级,反应随酸度增高而加快,其表观动力学常数与 $[H^+]$ 近似成正比关系,这与Penner的结果(pH在0.441—0.863区间,聚合反应速率与 $[H^+]$ 成正比)相一致。这也与本实验室以前工作所得结论(当反应进行较长时间后,单硅酸的消失速度变慢,反应接近于三级)相一致。絮凝剂对中聚硅酸的聚合作用有明显影响,硅酸从低聚到形成高聚的过程是个连续反应:

低聚硅酸 \rightarrow 中聚硅酸 \rightarrow 高聚硅酸。

A STUDY ON THE FORMS AND POLYMERIZATION KINETICS OF SILICIC ACIDS IN STRONGLY ACIDIC ELECTROLYTE SOLUTIONS. Liu Haicheng, Chen Rongsan et al. (*Coordination Chemistry Institute, Nanjing University*) Studies have been made on the forms of silicic acids and their transformations in strongly acidic electrolyte solutions with Si content of 150 mg/l and 100mg/l after different heating treatments and the addition of various flocculating agents. The results show that the polymerization of low molecular weight silicic acids are close to a third order reaction, with an apparent kinetics constant which is roughly proportional to the concentration of hydrogen ion. Although the flocculating agents have little effect on the polymerization kinetics behavior of low molecular weight silicic acids, they do increase the polymerization rate of the intermediate molecular weight silicic acids. The polymerization kinetics of silicic acids can reasonably be described by a consecutive reaction.