CREATING CHEMISTRY TO OVERCOME WATER QUALITY ISSUES: TAILORED COLLECTORS IN APATITE FLOTATION

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Key Words: water hardness; fluorsilicate; dissolved ions; apatite flotation.

Water quality is a critical yet often overlooked factor in phosphate beneficiation. Cationic species like Ca^{2+} and anions such as F^- can impair froth flotation by reducing collector efficiency and blocking calcite-active sites on apatite. In Brazilian operations, poor water quality has led to significant drops in P_2O_5 recovery, prompting the need for chemical innovations. This study employed x-ray fluorescence (XRF) and ion chromatography (IC) to quantify Ca^{2+} and SiF_6^{2-} (as F^-), and to estimate their interactions with collectors and apatite surfaces. Laboratory flotation tests demonstrated how severely flotation performance is compromised by poor water quality. The use of additive DP-OMC-1910 (40–450 g/t) mitigated these effects, improving P_2O_5 recovery from 22% to 62% under hardness levels of 25–200 mg/L. Additionally, the collector DP-OMC-1474 demonstrated superior resistance to water hardness, enhanced surface hydrophobicity and overcame fluoride-induced site blockage, outperforming traditional fatty acid-based reagents.