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Ferrites of the MeFe2O4 System (Me – Zn, Cu, Cd) and Their Two Faces

Authors : B. S. Boyanov, A. B. Peltekov, K. I. Ivanov

Abstract : The ferrites of Zn, Cd, Cu, and mixed ferrites with NiO, MnO, MgO, CoO, ZnO, BaO combine the properties of dielectrics, semiconductors, ferro-magnets, catalysts, etc. The ferrites are used in an impressive range of applications due to their remarkable properties. A specific disadvantage of ferrites is that they are undesirably obtained in a lot of processes connected with metal production. They are very stable and poorly soluble compounds. The obtained ZnFe2O4 in zinc production connecting about 15% of the total zinc remains practically insoluble in dilute solutions of sulfuric acid. This decreases the degree of recovery of zinc and necessitates to further process the zinc-containing cake. In this context, the ferrites; ZnFe2O4, CdFe2O4, and CuFe2O4 are synthesized in laboratory conditions using ceramic technology. Their homogeneity and structure are proven by X-Ray diffraction analysis and Mössbauer spectroscopy. The synthesized ferrites are subjected to strong acid and high temperature leaching with solutions of H2SO4, HCl, and HNO3 (7, 10 and 15 %). The results indicate that the highest degree of leaching of Zn, Cd, and Cu from the ferrites is achieved by use of HCl. The resulting values for the degree of leaching of metals using H2SO4 are lower, but still remain significantly higher for all of the experimental conditions compared to the values obtained using HNO3. Five zinc sulfide concentrates are characterized for iron content by chemical analysis, Web-based Information System, and iron phases by Mössbauer spectroscopy. The charging was optimized using the criterion of minimal amount of zinc ferrite produced when roasting the concentrates in a fluidized bed. The results obtained are interpreted in terms of the hydrometallurgical zinc production and maximum recovery of zinc, copper and cadmium from initial zinc sulfide concentrates after their roasting.

Keywords : hydrometallurgy, inorganic acids, solubility, zinc ferrite
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