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# Magnetic Solvent Extraction Using Nanoparticles Coated by Oleic Acid

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**Abstract :** In solvent extraction operations, large sedimentation areas in the mixer-settler are required when the disengagement of the aqueous and the organic phases is slow and/or difficult. The use of a magnetic organic liquid (also known as ferrofluid), consisting of magnetite nanoparticles coated by oleic acid dispersed in the organic diluent, has proven successful to speed up phase disengagement. The method, however, has never been used industrially; therefore, the aim of this study is to raise its main limitations. Tests were carried out using a ferrofluid containing 30 g/l of magnetite dissolved in commercial aliphatic kerosene Exxsol D80. The efficiency of cobalt extraction ([Co] = 1 g/l) with 10% v/v Cyanex 272 (bis-2,4,4-trimethylpentyl phosphinic acid) at changing pH of the aqueous phase (2 to 7) was found unaffected in the conditions studied. However, the chemical resistance of the ferrofluid in contact with deionized water at changing acidity (from 10-7 to 2 mol/l) revealed that the nanoparticles are not resistant when contacted to aqueous solutions with a pH ≤ 2. Such result represents a serious limitation to the applicability of the method mainly to hydrometallurgical systems because solvent extraction operations are normally done in acid conditions, therefore more effective strategies to coat the particles are required.

**Keywords :** magnetic solvent extraction, oleic acid, magnetite nanoparticles, cyanex 272
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