A new triaza dibenzosuloxide: 7,10,13-triaza-1-sulfoxo-4,16-dioxo-20,24-dimethyl-2,3,17,18-dibenzo-cyclooctadecane-6,14-dione macrocycle was synthesized. The structure of this compound was confirmed by IR, $^1$H and $^{13}$C NMR and mass spectroscopic means [1-3]. A simple, efficient and sensitive procedure is described for spectrophotometric determination of trace amounts of Cu$^{2+}$, Cd$^{2+}$ and Zn$^{2+}$ with this macrocycle. The complexation reactions between this macrocycle and Cu$^{2+}$, Cd$^{2+}$ and Zn$^{2+}$ have been studied in methanol solution, at 25°C. All of the complexation between the macrocycle and Cu$^{2+}$, Cd$^{2+}$ and Zn$^{2+}$ formed 1:1 complexes and the formation constant of each complexes determined. The UV-absorption spectra of these cations with the macrocycle are strongly overlapping. A partial least squares (PLS) multivariate calibration method for the analysis of ternary mixtures of Cu$^{2+}$, Cd$^{2+}$ and Zn$^{2+}$ was developed. The experimental calibration was designed with 15 samples. The concentration varied between 0.4-5.2 $\mu$g/ml for Cu$^{2+}$, between 0.2–3.5 $\mu$g/ml for Cd$^{2+}$ and between 0.3–4.3 $\mu$g/ml for Zn$^{2+}$. The cross-validation method was used to select the number of factors. Applying this method to simultaneous determination of these cations in several synthetic solutions and water of sea with total relative standard error of less than 5% validated the proposed method.

References