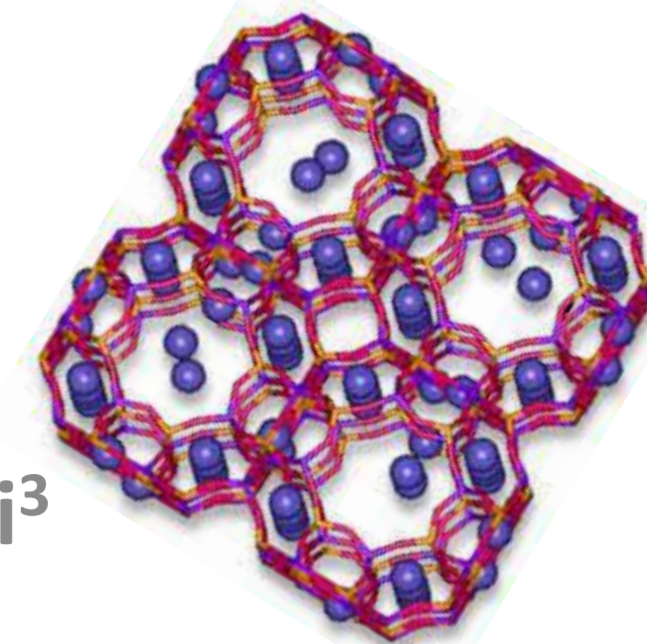


Sorption-luminescence method for determination of neodymium using Na-modified clinoptilolite



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Sorption of determination element on the solid matrix is one of the effective method for increasing sensitivity and selectivity of luminescence (LM) determination. Promising materials for solid phase spectrofluorometry are natural zeolites activated by REE ions. These inorganic nanomaterials have ability to include lanthanides ions in the grid using exchanged reactions. These ion save their ability to react with organic ligand. The sorbates that have been created on the zeolite surface have the ability to absorb UV–Vis–radiation and intensive LM. The possibility for LM determination of Nd using Na-modified Transcarpathian clinoptilolite as a sorbent was studied. The Nd(III)–Na-clinoptilolite samples were obtained via lanthanide ions sorption from aqueous solution at pH 6.0 on the Na-modified zeolite in a solid phase extraction mode. The Nd(III)–Na-clinoptilolite samples were pre-calcined at 500°C treated by the mixture of xylenol orange and ethonium at pH 8.0 in a static mode. Obtained samples of the Na-clinoptilolite–Nd(III)–xylenol orange–ethonium luminophore were dried at 100°C (Fig.1). For the excitation of LM samples rays with the wavelength of 532 nm were used. The intensity of the LM at 875 nm was chosen as analytical parameter for the quantitative determination of Nd (Fig. 2). The linear range of determined concentrations of Nd(III) using the proposed sorption-luminescence method remains within 12–250 ng/mL. The limit of detection of Nd(III) is equal to 4 ng/mL. The proposed method can be used for neodymium determination in the presence of many rare earths (Table).

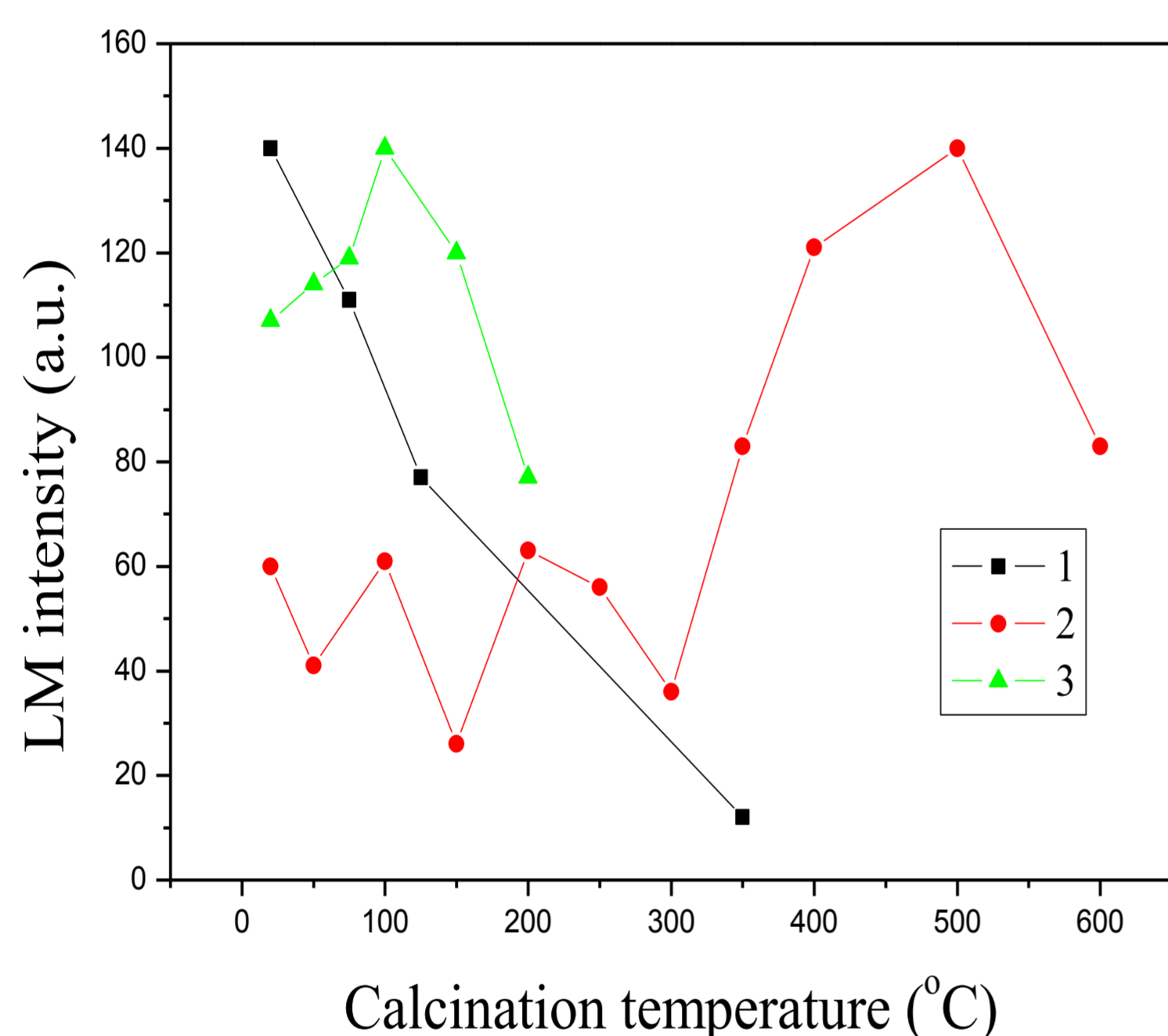


Fig. 1. Dependence of luminescence intensity of the “Na-clinoptilolite–Nd(III)–xylenol orange–ethonium” luminophore on the temperature of precalcination of Na-clinoptilolite (1), Na-clinoptilolite–Nd(III) (2) and Na-clinoptilolite–Nd(III)–xylenol orange–ethonium (3).

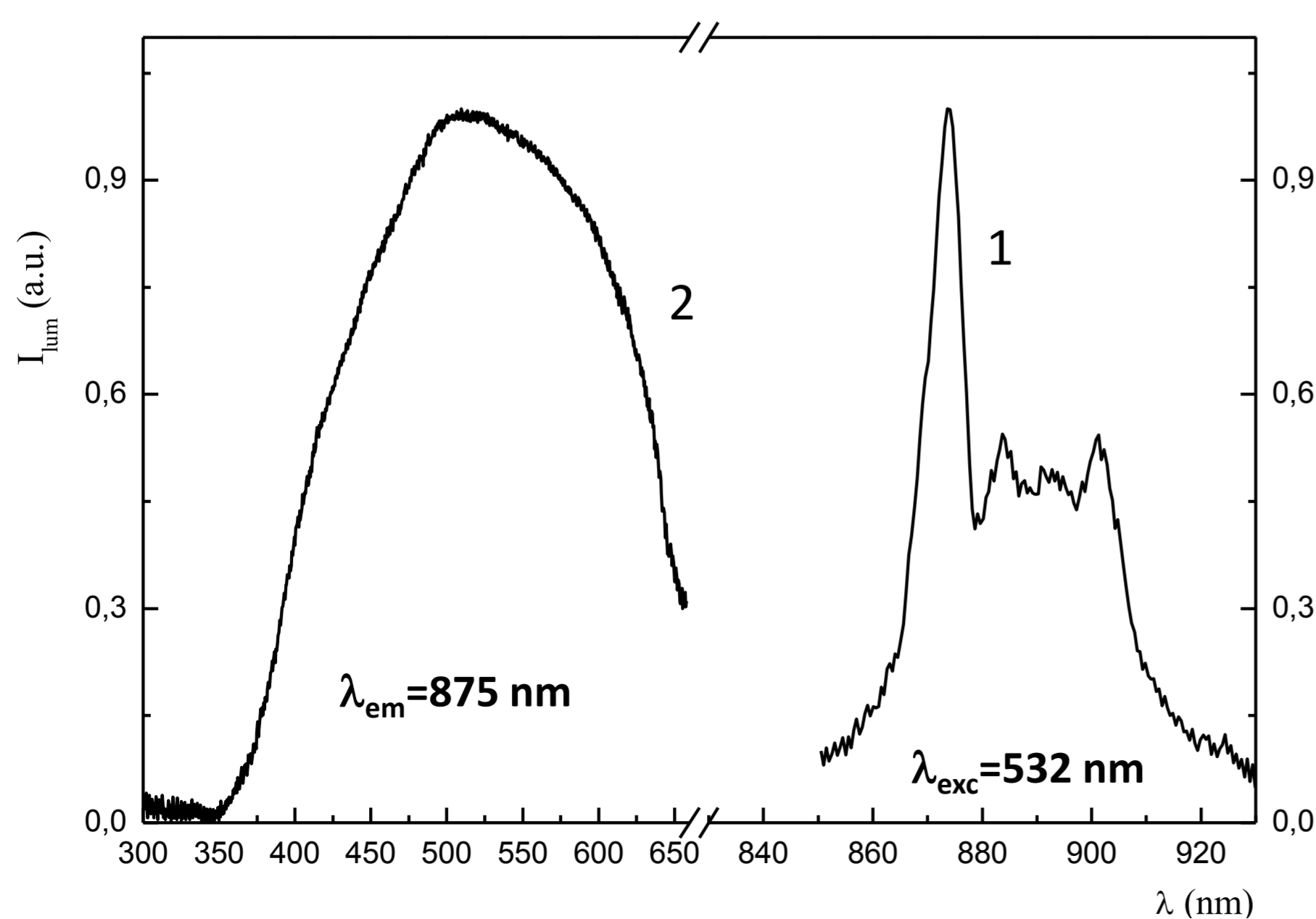


Fig. 2. Emission spectra of the Na-clinoptilolite–Nd(III)–xylenol orange–ethonium excited at 532 nm (1) and the excitation spectrum at 875 nm (2)

Tolerance limits of RE ions for luminescent determination of neodymium

Ion	Tolerance limit ($C_{ion} / C_{Nd(III)}$)
Ce ³⁺	0.03
Lu ³⁺ , La ³⁺	1
Y ³⁺	0.05
Tm ³⁺ , Er ³⁺	0.5
Gd ³⁺ , Pr ³⁺	0.1
Tb ³⁺ , Dy ³⁺	10
Eu ³⁺ , Sc ³⁺	15
Yb ³⁺	2
Ho ³⁺	0.2
Sm ³⁺	3

