

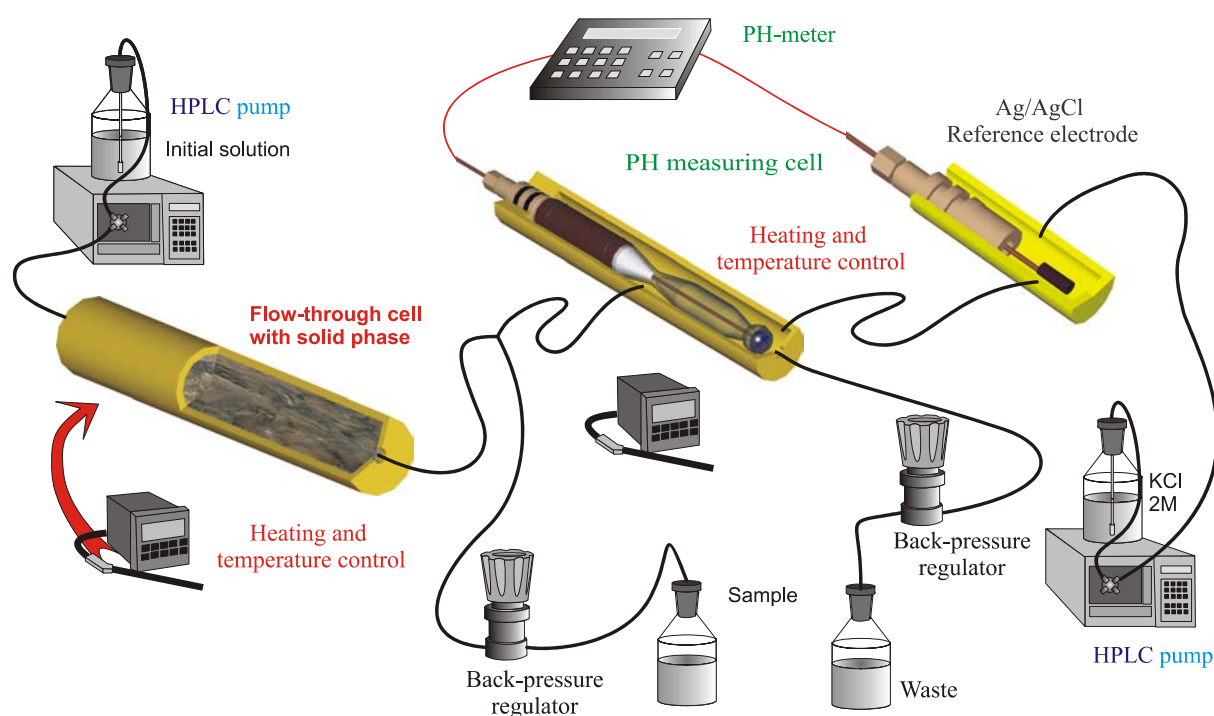
# EXPERIMENTAL STUDY NEODYMIUM CARBONATE $\text{Nd}_2(\text{CO}_3)_3 \cdot n\text{H}_2\text{O}$ SOLUBILITY AT 90°C AND PRESSURE OF 100 BAR

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In order to study carbonate complexes of Rare-earth elements (REE) a solubility of neodymium carbonate was studied at 90°C and 100 bar using flow-through system which includes reactor with solid phase and pH measurement cell. The scheme of system is shown in fig. 1. Pumping of solutions was carried out using two high pressure pumps. Equilibrium in the system was achieved within several minutes. Sampling was carried out from reactor output using a test-tube with aliquot of nitric acid. Simultaneously the pH of the effluent solution was measured. The structure of a solid phase was determined by XRD analysis before and after experiment.

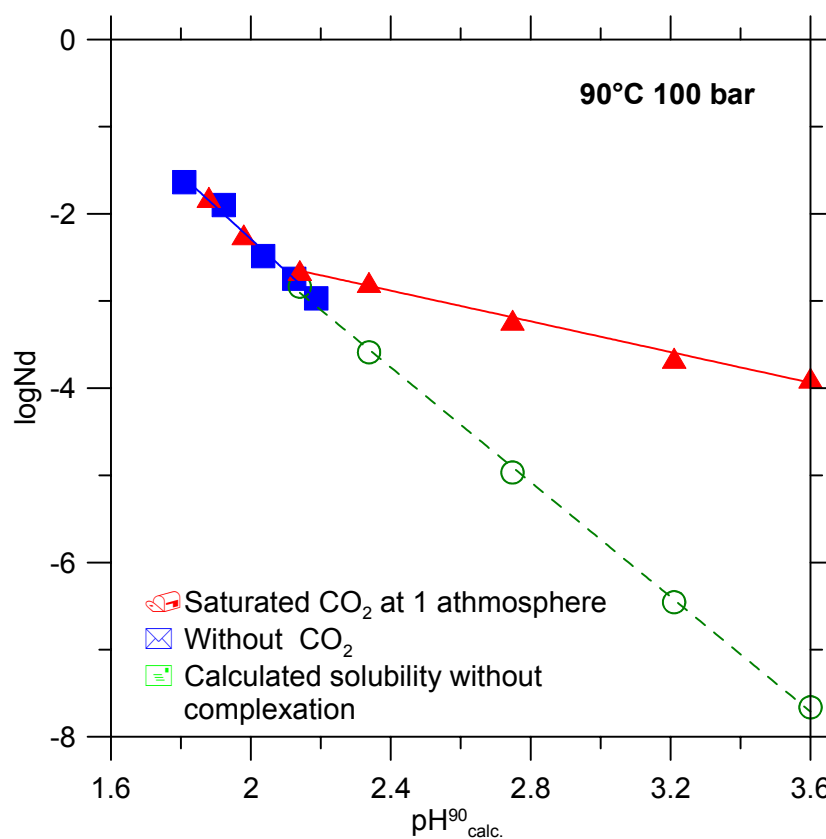


**Fig. 1.** The scheme of the flow-through system for solubility studies

Because thermodynamics of solid Nd-carbonate is known poorly special experiments on  $\text{Nd}_2(\text{CO}_3)_3$  solubility in acidic solutions in the absence of  $\text{CO}_2$  have been conducted. Thus free energy of formation  $\text{Nd}_2(\text{CO}_3)_3$  was estimated  $\Delta_f G^\circ = -3219.113 \pm 1.4 \text{ kJ/mol}$

At the next stage solubility of a neodymium carbonate in  $\text{CO}_2$ -bearing solutions was carried out. During these experiments perchloric acid solutions with molality of  $10^{-1}$ - $10^{-4}$ , saturated with  $\text{CO}_2$  at atmospheric pressure, were pumped through the system. The increase in solubility was observed, that, most likely, is related to formation of carbonate complexes of Nd. Dependence of neodymium concentration from calculated pH is shown in fig. 2. Corresponding pH values of the solutions at 90°C and 100 bars were calculated using program GIBBS.

It was found that stoichiometry of the complexes could not be unambiguously specified on the basis of available experimental data. Influence of both  $\text{NdCO}_3^+$ ,  $\text{NdHCO}_3^{++}$  and  $\text{Nd}(\text{HCO}_3)_2^+$  complexes can explain the observed dependencies. To solve the problem pH measurements *in situ* is necessary.



**Fig. 2.** Solubility of a neodymium carbonate depending on contain and pH of initial solution

Thus, the preliminary data on solubility of a neodymium carbonate are obtained at various values of pH of initial solutions of perchloric acid and different concentrations of CO<sub>2</sub>. Solubility of neodymium carbonate in the CO<sub>2</sub>-saturated solutions is higher than solubility in the CO<sub>2</sub>-free system. This is related to formation carbonate complexes of Nd.

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