Electrokinetical properties and stability of cerium dioxide suspensions

S.Barany[1], K.Bohacs[3], I.Chepurna[4,*], R. Meszaros[1]

[1]*MTA-ME Materials Science Research Group, Institute of Chemistry, University of Miskolc, Miskolc-Egyetemvaros, 3515, Hungary*
[2] *The Transcarpathian II. Ferenc Rakoczi Hungarian Institute*
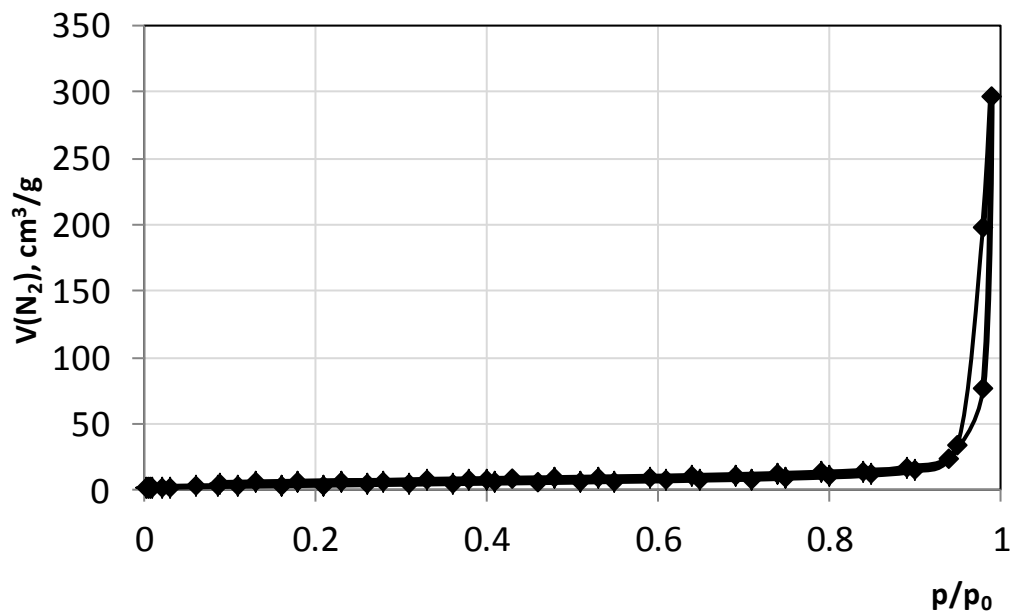*6 Kossuth sq., Beregovo, 90200 Ukraine*
[3] *Institute of Raw Materials Preparation and Environmental Processing, University of Miskolc, 3515, Hungary*
[4]*Institute for Sorption and Problems of Endoecology National Academy of Sciences of Ukraine, 13, General Naumov str., 03164 Kyiv, Ukraine*
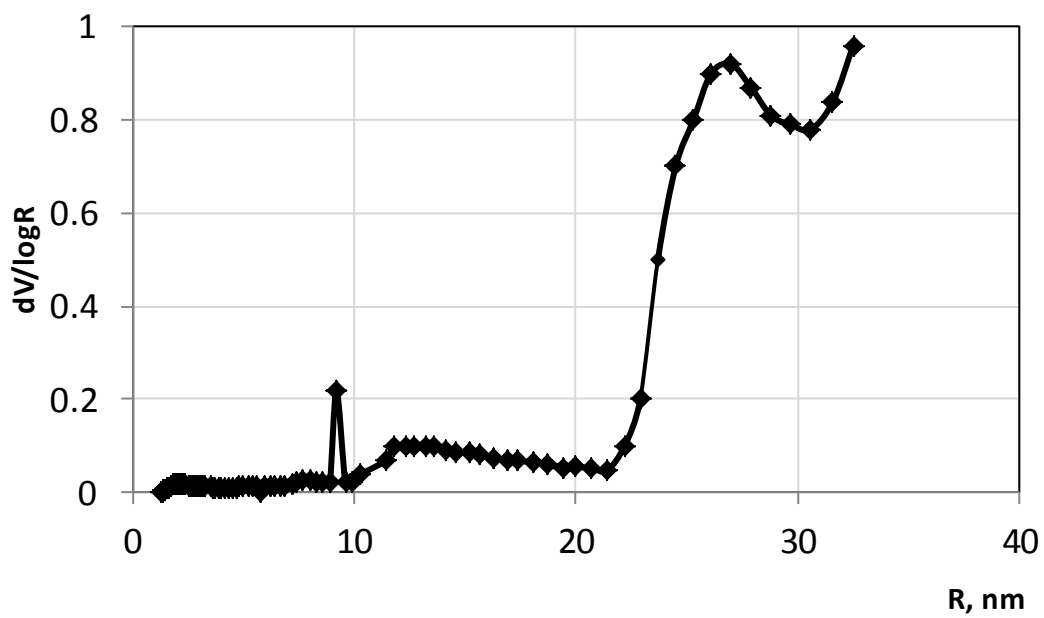
Table 1

Porous structure of cerium dioxide

Surface area, m^2/g	15.4
Total pore volume, cm^3/g	0.46
Pore diameter, nm	75.8

(a)

(b)

Fig. 1 N_2 adsorption-desorption isotherm (a) and pore size distribution curve (b) for cerium dioxide.
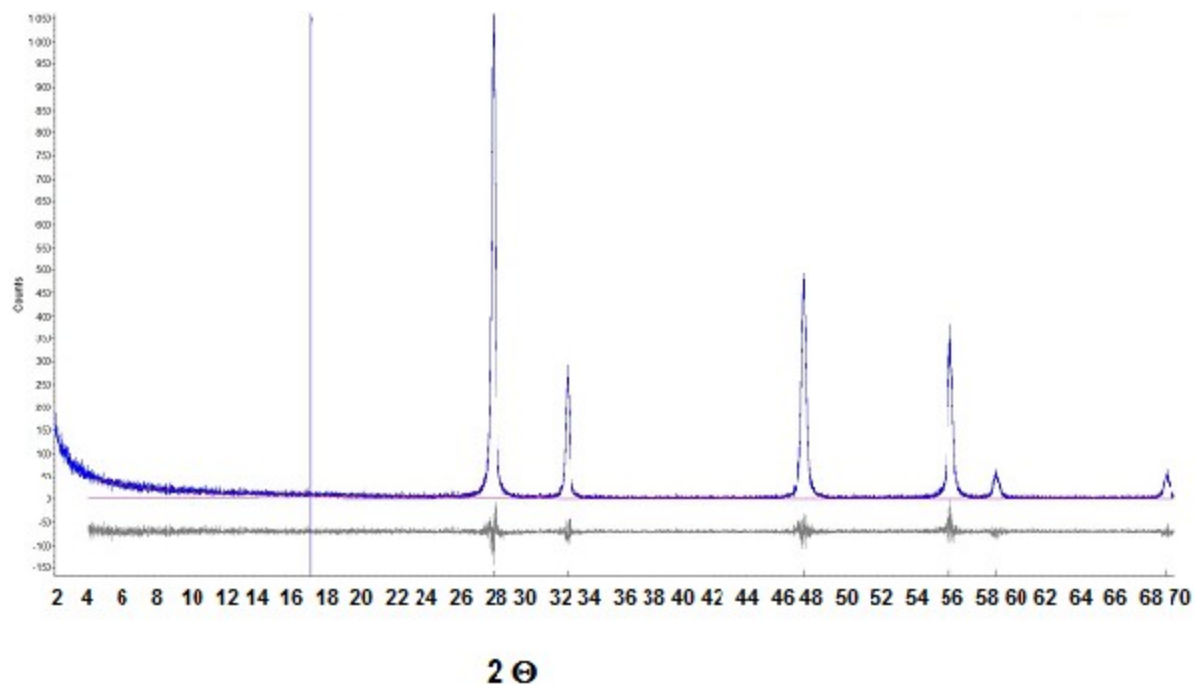
Fig. 2 X-ray diffraction pattern for cerium dioxide powder calcined at 750 ^{0}C/ 2 h.
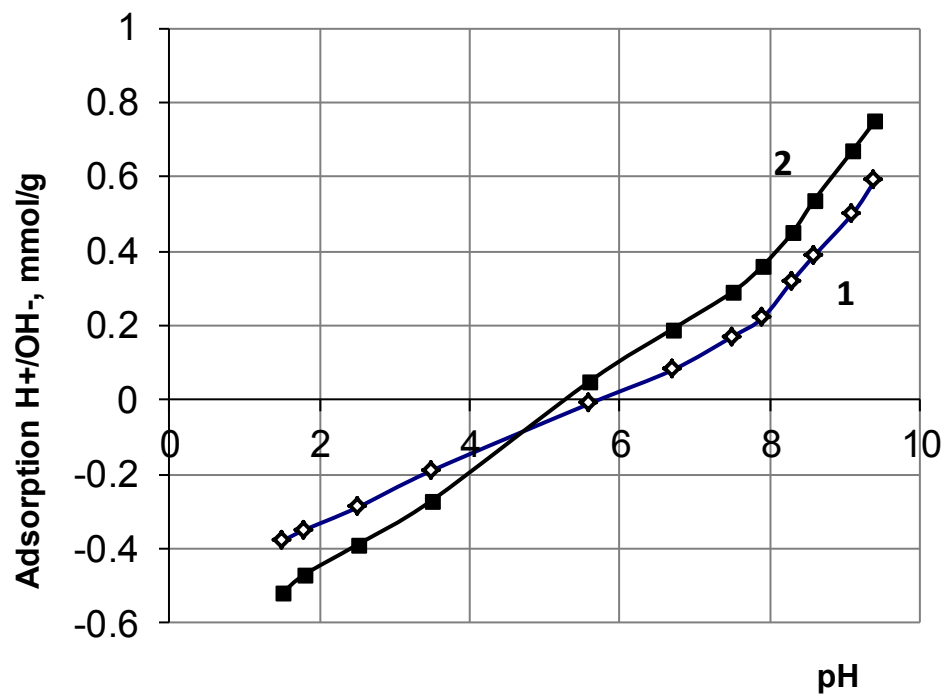
Fig.3 Potentiometric titration curves of CeO_2 suspension by HCl and KOH in DI water (curve 1) and 1 mmol KCl solution (curve 2).
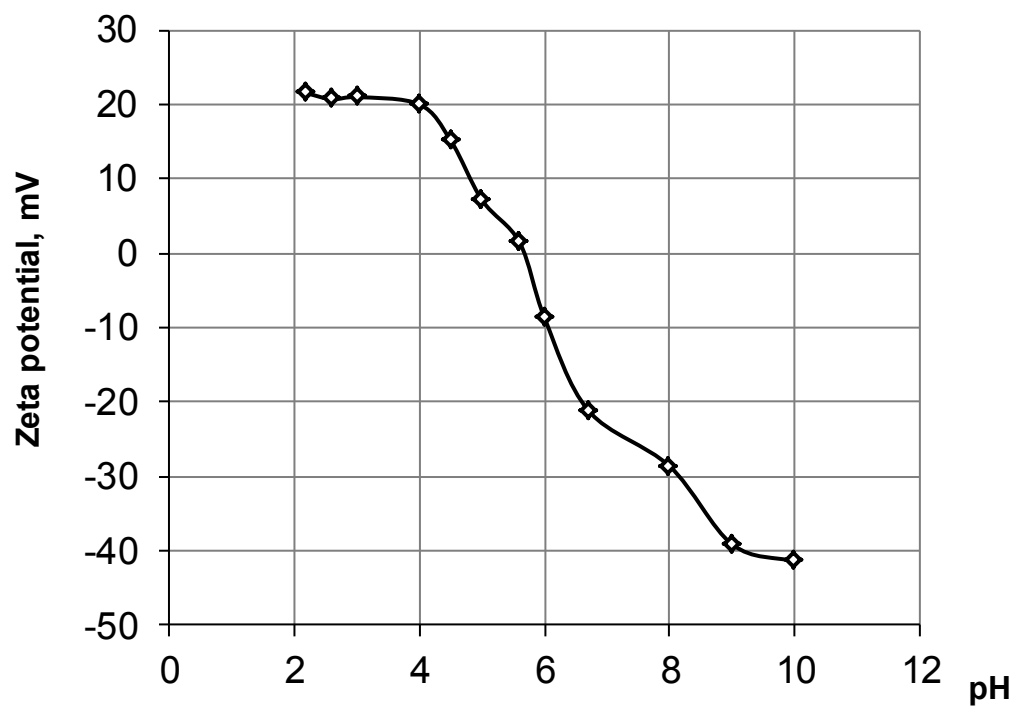
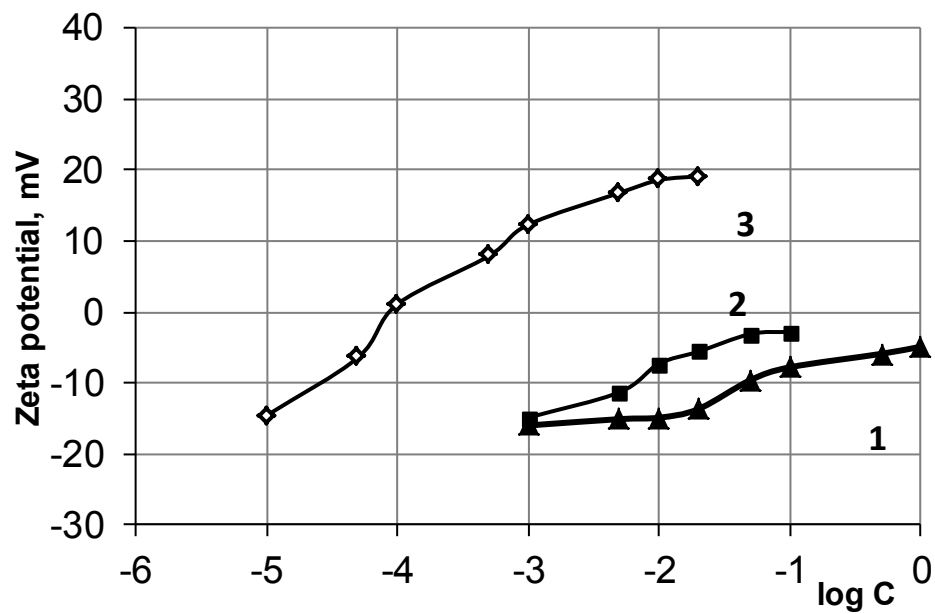**Fig.4** Zeta-potential of CeO$_2$ supension versus pH.

Fig. 5 Zeta potential of CeO$_2$ suspension versus concentration of added electrolytes at pH 6.2: KCl (1), CaCl$_2$ (2) and AlCl$_3$ (3).
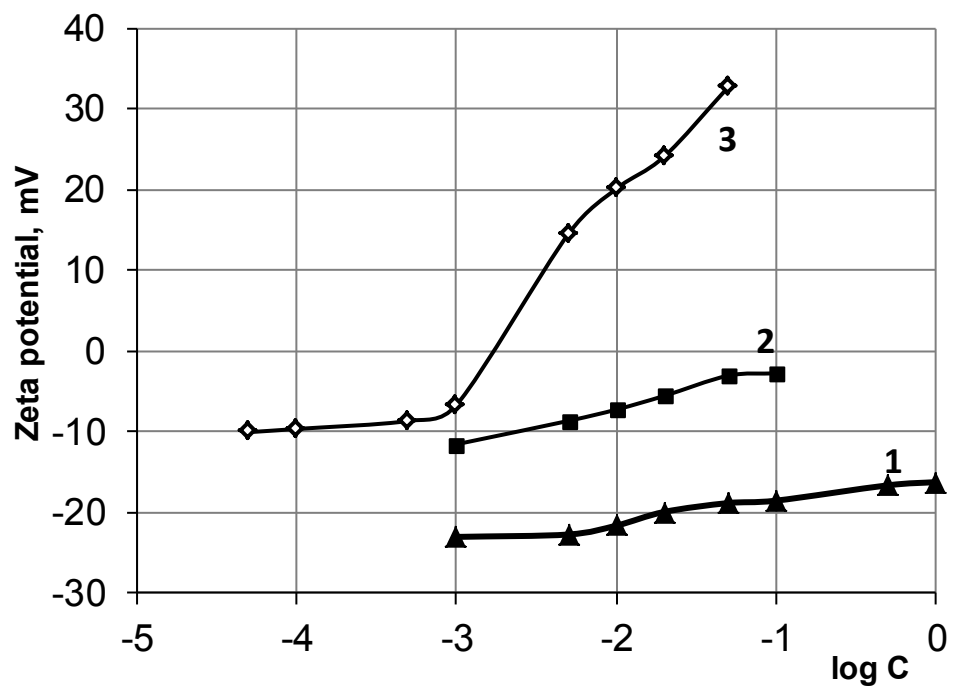
Fig. 6 Zeta potential of CeO$_2$ suspension versus concentration with addition of different electrolytes at pH 9.8: KCl (1), CaCl$_2$ (2) and LaCl$_3$ (3).
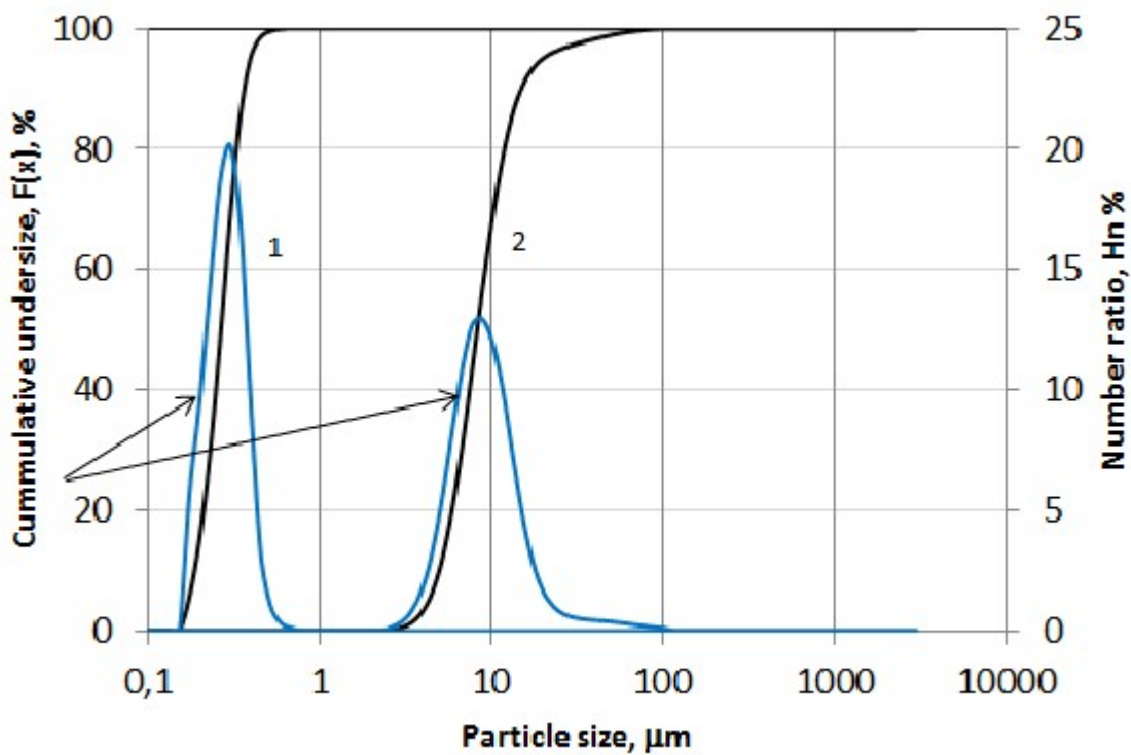
.

Fig. 7 Particle size distribution of freshly prepared and aged CeO$_2$ suspensions: curve 1- immediately after 20 min of external ultrasonic treatment at 35 kHz, curve 2 - shelf life -1 week.; C(solid) = 0.1 g/L, pH = 6.2.
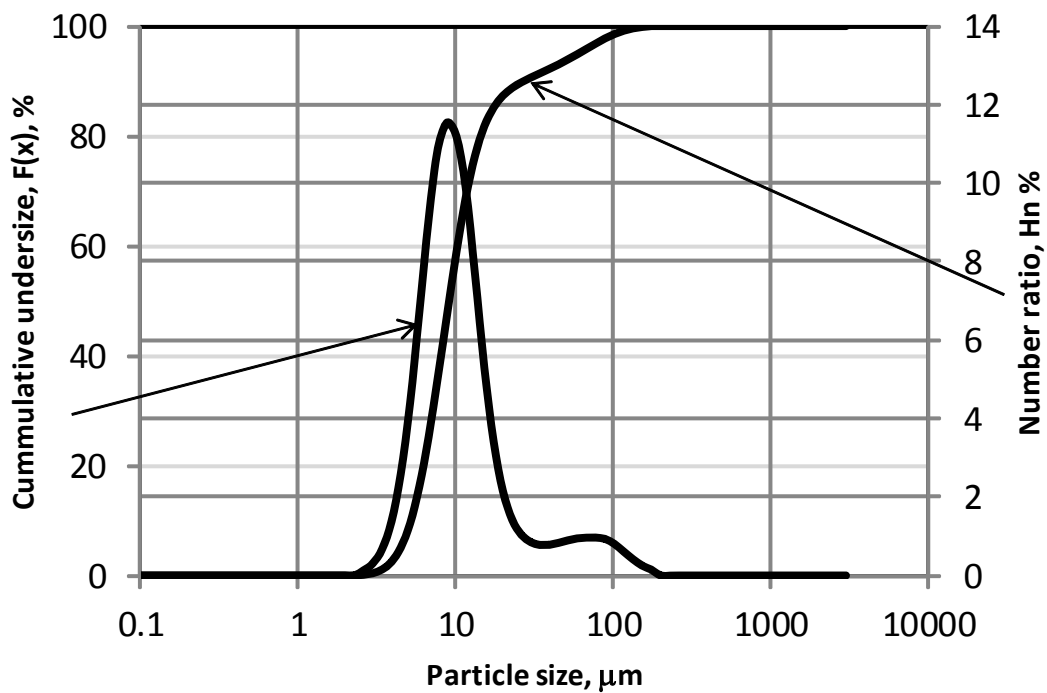
Fig.8 Particle size distribution of aged CeO₂ suspension at pH 9.8 (Shelf life -1 week).
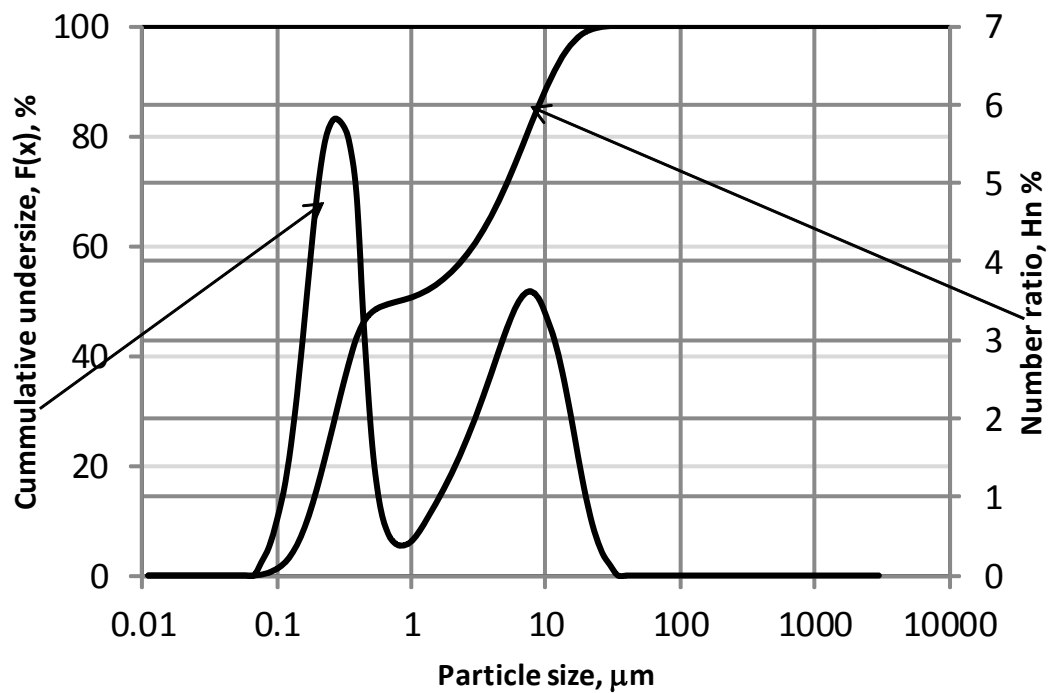
Fig. 9 Particle size distribution of aged CeO$_2$ nanosuspension at pH 6.2 (Shelf life - 1 week). Duration of ultrasonic treatment in the measuring unit – 3 min; frequency -22kHz.
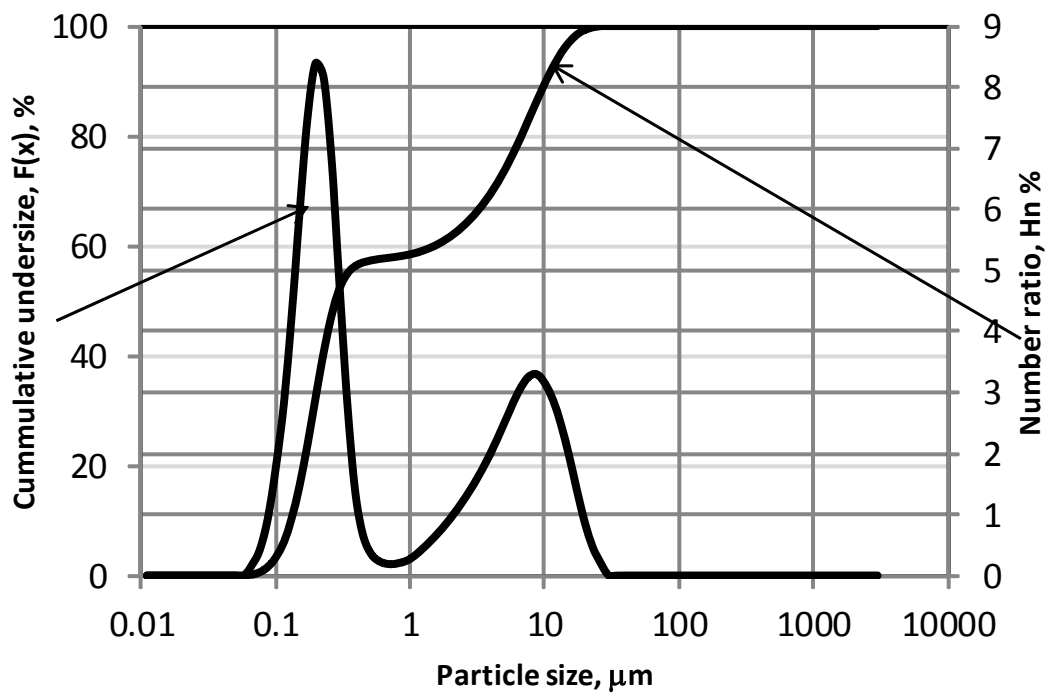
Fig. 10 Particle size distribution of aged CeO_2 nanosuspension at pH 9.8 (Shelf life -1 week). Duration of ultrasonic treatment in the measuring unit– 3 min; frequency -22kHz.
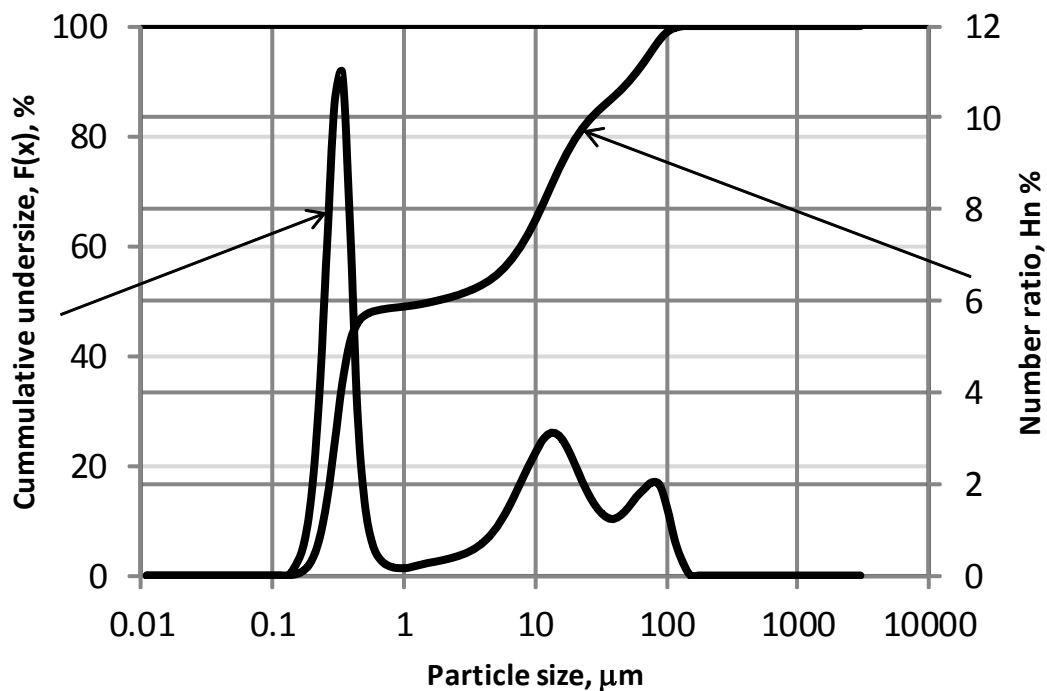
Fig. 11 Particle size distribution of aged CeO$_2$ nanosuspension at pH 6.2 (Shelf life -1 week). Time of ultrasonic treatment in the measuring unit – 2 min; Time of subsequent stay after ultrasonic treatment -2 min (at gentle agitation in the circulating system).
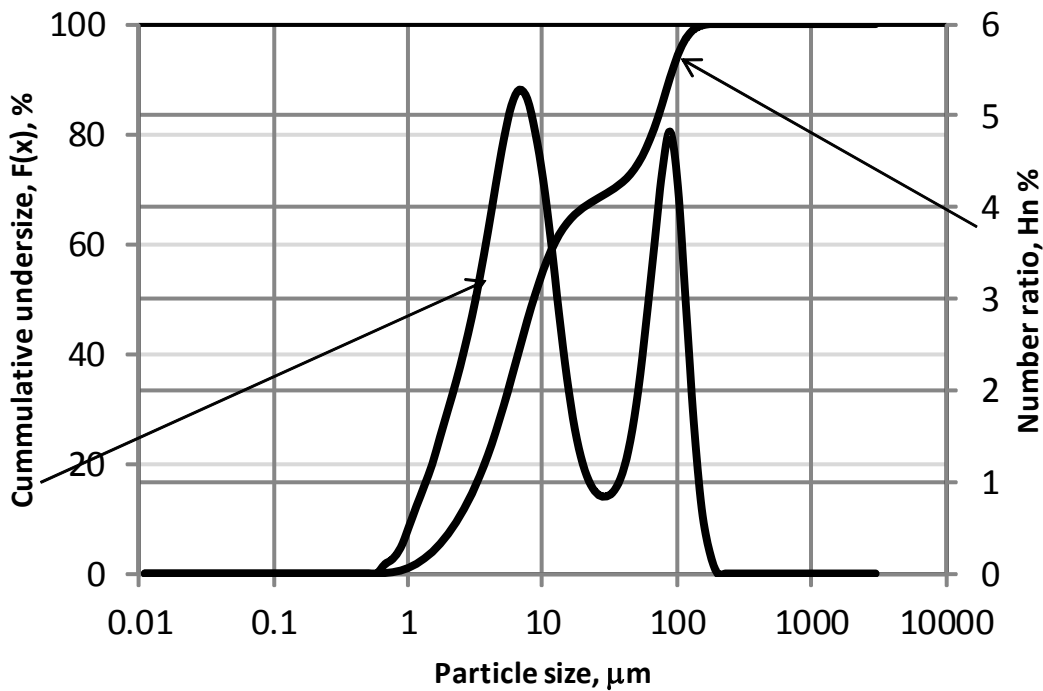
Fig. 12 Particle size distribution of aged CeO$_2$ suspension at pH 6.2, presence of KCl (C=40 mmol/L) and gentle agitation in the circulating system.
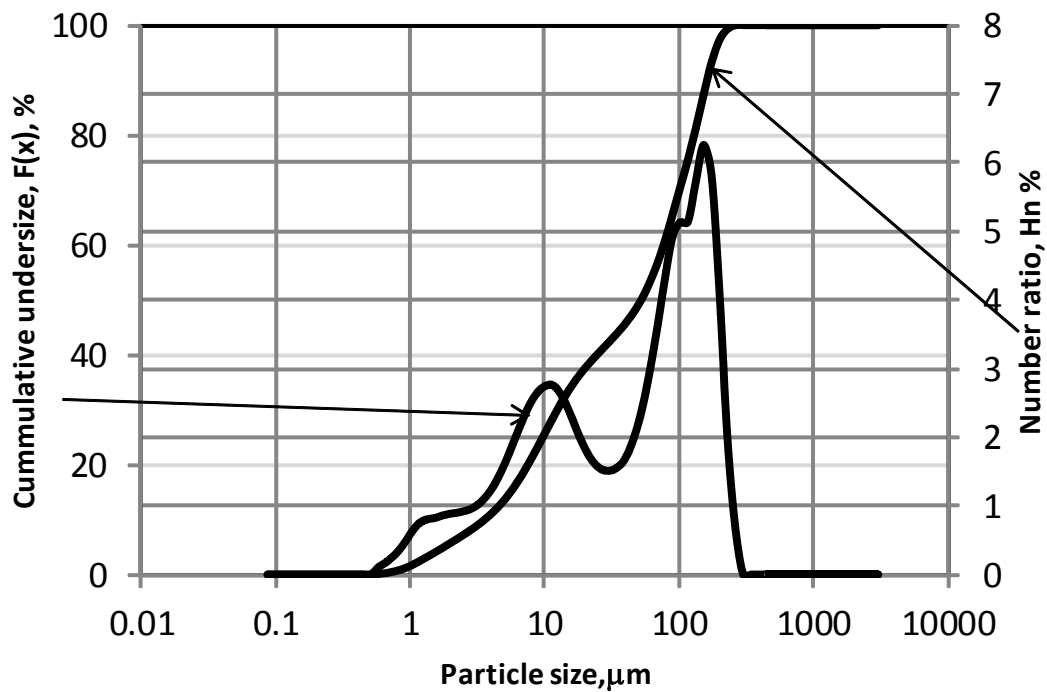
Fig. 13 Particle size distribution of aged CeO$_2$ suspension at pH 6.2, in the presence of CaCl$_2$ (C=2.1 mmol/L) and gentle agitation in the circulating system.