Nova analysis aquarum Medeviensium

Jöns Jacob Berzelius

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"Nova analysis aquarum Medeviensium" is a scientific paper in Latin
about the quality of the water of the health spa at Medevi in Sweden,
published in 1800 by Swedish chemist Jöns Jacob Berzelius (1779-1848).

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Regio Collegio Medico
Sacrum.

NOVA ANALYSIS
AQUARUM MEDEVIENSIUM

Quam
Venia ampliss. ord. philos.
p. p.
Præses
Mag. A. G. EKEBERG
chem. Adjunctus
Reg. Acad. Scient. Stockh. Membr.
ET
AUCTOR
JACOBUS BERZELIUS
Ostrog. Stip. Strandb.
In audit Gust. Maj. D. VI Decemb. MDCCC.

Upsaliæ
Litteris Joh. Fr. Edman, Reg. Acad. Typogr.

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NOVA ANALYSIS AQUARUM MEDEVIENSIUM

Aquæ Medevienses a Cel. BERGMAN primum justa & consummata analysi chemica exploratæ sunt. In actis Reg. Acad. Scient. Holm. An. 1783. P. 4, p. 218, hanc suam disquisitionem exposuit. Sed Cel. Medicus S. R. M. Primarius etc. D. Doct. S. HEDIN, hujus institutionis præfenti tempore curator (Brunns Intendent,) cum variare interdum naturam fontium & elementorum rationem, assiduis nobilissimorum chemicorum investigationibus confirmatum esse, & in recentissimis præterea chemiæ profectibus majora ad disquisitiones hujus generis subtilius instituendas subsidia esse posita reputaverit, æstate superiori novam analysin suscipiendam esse censuit; eamque mihi, ad Medevi vices Chirurgi, ejus auspicio, tunc gerenti, mandavit. Quam cura diligentiaque quanta maxima potuerim peractam, propter magnam ab experientia summi viri discrepantiam, eorum. qui his rebus student, judicio esse submittendam existimavi. Et cum etjam celebratum Loka fontem limumque, antea rite consummateque non examinatum, eadem hac præterita æstate, ab ejus curatore D:o Doct. etc. ASCHAN sollicitatus, adcurate sim perscrutatus, brevem ejus descriptionem, reservata in aliam occasionem copiosiori experimentorum expositione, adjungere, ob materiæ similitudinem, institui.

Ex tribus fontibus, quibus jam uti licet, unus tantum, & is infimus, ante nostram ætatem scaturivit. Olim quidem tres etjam numero fuerunt fontes; duo autem reliqui, quos Cel. BERGMAN Rödbrunn & Dahlbrunn

appellat, jam ita cessaverunt, ut ne locum quidem ubi siti fuerint, reperire potuerim. At curante Cel. HEDIN alii duo nuper aperti sunt & ædiculis belle superstructis hoc anno consummatis, tecti; ut pauperibus usui essent, quibus antea circa horam tertiam matutinam surgendi, necessitas erat, ne ex unica scaturigine petita aqua opulentioribus ad horam sextam fontem adeuntibus deesset.

Vetus sive infimus fons.

Situs ejus est aliquanto depressior, ita tamen ut defluxus sit facilis. Intra ædificium alto muro circumdatur, qui ad æquabile frigus conservandum plurimum confert. Profundus est V pedes. Cantharos circiter LX per horam effundit, cli temporisque varietate parum affectus. Temperatura in superficie + 6,º5; ad fundum 6,º intra menses æstivos non mutata. Sapor asper, multis nauseosus. Odor concussione exprimitur hepaticus. In aperto vase sensim oxidum ferri demittit, & odorem saporemque asperum perdit. Tincturam Heliotropii rubefacit, at non post coctionem ferrive demissionem. Calce soluta turbatur, sed non post coctionem. Acidum carbonicum in aqua ita prodi docent, si primo calcis solutionem turbaverit, uberius autem adfusa solverit quæ præcipitata erant; quod vero hic non incidit, cum ferrum etjam præcipitetur, ex quo præcipitarum flavescit; in aqua autem nihil vel parum adsir liberi acidi carbonici. Cum acido sulphurico forti nulla effervescentia. Solutiones Fernambuci aut Curcumæ non mutatæ. Cum ac. gallaceo color violaceus; prussiate kali cæruleus purissimus; ex quo post quietem XXIV horarum prussias ferri depositus; utrumque in aqua cocta inefficax. Acidum oxalicum paullulum permutavit, sed non in cruda solum, verum etjam in cocta; quod sulphatem calcis prodit. Carbonas kali nihil. Natrum purum post horas XXIV luteolum præcipitatum effecit. Similiter ammoniacum. Aliquantulum ac. azotici in aquæ portionem instillabatur, quæ dein azotate barytæ præcipitabatur: pauxillum illud, quod post h. XXIV demissum erat, inde separabatur, quo facto aqua azotate argenti præcipitabatur; hoc præcipitatum suisse muriatem argenti exinde colligimus, quod luci expositum nigrescebat; quod in carbonatibus argenti non accidit. Azotas hydrargyri frigide præparatus album dedit & subtile præcipitatum, ad labra vitri adhærens, & vix sensibile antequam aqua effusa, vitrum aruisser. Azotas hydr. calide præparatus & azotas plumbi præcipitata fecerunt e luteo candicantia. Ad detegendum in aqua hydrogenium sulphuratum multa sunt a chemicis proposita, at pleraque non nisi in aquis saturatoribus efficacia. Ejusmodi sunt: argentum metallicum; sed in fonte suspensus nummus argenteus bene politus post IIX dies æque splendebat; oxidum arsenici album; id vero in hac aqua æquali tempore nihil passum est; acidum azoticum conc. quod, hydrogenium oxidando sulphur præcipitare docent; illud autem heic nihil tale effecit. Nihilominus olfactus hydrogenii sulphurati in hac aqua index certissimus est. Azotas plumbi in forma sicca ad hydr. sulph. valde sensibilis est; at solurus, propter suam ad aquam attractionem, sulphure difficilius decomponitur. Scribebam autem hac solutione in charta, quæ vasi, in quo aqua fontana evaporaretur, superimponebatur: vas sensim calefactum est, ut gas hydr. sulph. quantum fieri posset siccum eliceretur: qua re etjam factum est, ut litteræ seriptæ, pro varia gasis siccitate, quibusdam in locis metallice splenderent & nigrescerent; aliis magis minusve perspicuæ, aliis non observabiles essent.

Post hæc experimenta præcursoria, nostra in eo verfat, est opera, ut quæ in hac aqua soluta sint gasia fecernerentur. Quantum aquæ Cantharus unus capere potest [1] in vas retortum vitreum instillabatur ejus magnitudinis, ut tertia pars vacua maneret: orificium subere obturabatur, per quod aptatus erat tubus vitreus; cui vesica arcte adligabatur. Tubus ad apparatum pneumaticium ducebat. Aqua, qua hunc appatatum impleveram, quartam horæ partem cocta erat, & jam intra temperaturam + 85º & 100º, igne subtus facto, servabatur. Supra enim in recipulo pneumatico olei stratum fluitabat, ne, experimento peracto, gas ab aqua refrigerata imbiberetur. Quamquam aqua, ut diximus, antea diu servisset, bullæ tamen aëris jam exinde per oleum adscendentes animadvertebantur, ex cucurbita non venientes. Gas, quod in apparatu pneumatico, postquam aqua in cucurbita horæ tres quartas partes servisset, receptum erat, minoris aliquanto voluminis fuit eo, quod supra aquam in cucurbita fuerat, utroque in eadem temperatura menso; ex quo sequitur, vapores aquosos non omnem ex superiori cucurbitæ parte aërem expulisse; quapropter hac methodo nihil certi de quantitate naturave gasium in aqua fontana solutorum eruere licet. Alia igitur utendum erat. Nec apparatum a Cel. BERGMAN (Om Bitter-, Selzer-, Spa- och Pyrmontervattens halt och tillredning, § 8. Fig. 1.) comparare poteram. Hanc igitur, scopo, ut videtur, optime inservientem experiundi rationem inveni. Orificium lagenæ vitreæ, adcurate ejus capacitatem emensus, subere optimo obturabam, per quod tubus vitreus, ut in experimentis pneumaticis solet, curvatus ingerebatur ita, ut altera ejus extremitas ultra suber in lagena non exstaret. Et lagena & huic ita adjunctus tubus aqua examinanda implebantur, ne minima quidem aëris atmosphærici bulla observabili relicta. Lagena ad commissuram luto vesicaque rite munita, in balneo arenæ ponebatur. Apparatu pneumatico eodem as supra utebar; sed jam aqua plus horam ante initium experimenti fervisser. (Vas, in quo fervebat, ejus capacitatis erat, ut quod exhalaret cruda aqua compensare opus non esset). In ipso recipulo apparatus aqua, ut ante, oleo operiebatur. Huic methodo aliquis objicere forsitan posset, aquam fontanam in lagena calore valde dilatari ante quam gasia exinde abeant; ita partem expelli & amitti. Sed ubi hæc pars aquæ venerit in aquam bullientem apparatus pneumatici sub recipulum, gasia, quibus prægnans est, mox hujus calore in formam nativam restituta, effugere nequeunt. Postquam horæ dimidium aqua in lagena fervisset, summovebatur sensim ignis ad cautam refrigerationem. In temperatura +17º volumen gasium dimensum fuit 6,5 pollicum cubicorum decimalium pro quoque cantharo. Cel. BERGMAN 14 p. cub. ex. Cantharo accepit. Hæc discrepantia experimentum pluries iterare jussit; idem autem semper fuit eventus, si aberrationem 1/2 vel 3/4 p. c. exceperis, tribuendam temperaturæ , quam omnino æqualem obtinere non poteram. Iuncturam autem nec rimis latentibus fefellisse, tum illius post singula experimenta sollicita exploratio demonstravit, cum regressus aquæ ex apparatu pneumatico in lagenam frigescentem.

[1] Hoc loco & in sequentibas mensura coronata & accurate explorata utebar.

Ad vulgare præscriptum solutio calcis in gase his experimentis collecto collocabatur. Post XXXVI horas ex 6,5 p. c. dimidius tantum restabat, quam aëra esse atmosphæricum gas azoticum oxigenatum indicavit. Quorsum igitur gas hydrogenium sulphuratum, quod aquæ inesse certo sciebam? Id quo intëlligerem, lagenam, hoc gase, præparato ex sulphureto ferri ac acido sulphurico diluto, impletam supra calcem aqua solutam collocavi. Post XIV horas X p. c. absorpti

erant; supererat unus cum dimidio p. c., post XXIV horas nihil diminutus; quem esse atmosphæricum, gase azotico oxigenato exploravi. Gas hydr. sulph. & gas acidi carbonici ad æqualia volumina commixta & eidem experimento subjecta, ab aqua calcarea, uno p. c. relicto,. absorbebantur. Solutionis calcareæ in his experimentis, & præcipue in superiori, color erat luteoalbidus, odor saporque sulphureti calcarei; solutio sensim sulphatem calcis deponendo turbabatur, quod tamen in posteriori propter carbonatem calcis simul præcipitatum discerni non poterat. Ex quibus intelligitur, diminutionem supra descriptam gasis aquæ examinandæ non acido tantum carbonico sed gasi etjam hydr. sulph. esse tribuendam. Horum igitur gasium quantitates alia via dignoscendæ sunt. Eum in finem unum aquæ fontanæ Cantharum in vase operto calce præcipitabam; præcipitatum, cujus pondus erat = 0,085 [2] ex oxido ferri = 0,020, carbonate calcis magnesiæque aquæ proprio, aliis experimentis noto = 0,035, & carbonate calcis jam generato, cujus igitur pondus = 0,030, constabat. Si pondera carbonatis calcis & acidi carb. quod continet, sunt inter se = 100:43, oritur exinde pondus acidi carbonici ex aqua fontana recepti = 0,014; ex quo tamen volumen gasis ejus haud facile inveniri potest.

[2] Unitas ponderis per totam banc disfertationem = 1/4 lod viktualie-vigt = 1 drachma 7 1/2 gr. = 1 centner prober-vigt.

Unde autem oritur hujus aquæ gas hydrogenium sulphuratum? In quibusdam aquis non dubium est quin originem debeat sulphureto calcis, quod, dum ex aqua oxidatur, ideoque gas hydrogenium generat, illi sulphuris aliquid tradit; ipsum autem in sulphatem calcis transit, qui circum tales fontes, forma pulveris albi, se manifestat. In aqua Medeviensi sulphas quidem calcis adest, quem primo sulphuretum fuisse posse, deinde vero oxidatum, hoc gas, ut diximus, produxisse, haud quidem districte negaverim, vero tamen similius esse existimaverim, a stratis corporum organicorum putrefactorum vel putrescentium, per quæ vena transit, idem illud gas originem duxisse, quippe quod destructione animalium vegetabiliumque generari, ideoque ex stagnosis limosisque locis, præsertim commotione quadam facta, exhalari noverimus. Per hanc hypothesin explicatur etjam ortus gasis hydrogenii carbonati, quod in hoc & pluribus aliis Sveciæ fontibus adesse, cum alia fere desint ipsius indicia, sapor peculiaris certe arguit; quamquam ejus quantitas, propter minorem in aqua solubilitatem longe minor sit, necesse est; nec determinari potest nisi combustione; quam experiri, defectus instrumentorum prohibuit.

Ex quovis fonte V Cantharos, in vase vitreo, unum cum dimidio cancharum capiente, singulos vaporare curavi. Massa sicca caute colligebatur, & quod vitro arctius adhærebat, acido muriatico diluto abluebatur & solutioni N. 5 addebatur. Massæ in temp. + 108 siccatæ pondus =0,575.

1. Massa diligenter aqua eluebatur & liquidum siphone secernebatur, quo colatio evitaretur. Hæc aqua deinceps ad siccum vaporabat, supra infundebatur alcohol, qui non solutum reliquit album terrestre = 0,025, quod experimentis infra enarrandis sulphatem calcis esse reperi.

2. Solutio alcoholina lente evaporabatur; fusca erat, & crystallos muriatis natri facile agnoscibiles in reliqua massa fusca deliquescibili dabat [3]. Pondus totius massæ = 0,150. In aqua solvebatur, cui solutioni admistum ammoniacum purum nihil mutavit; sed

azotate barytæ præcipitatum efficiebatur, quod lotum siccatumque erat = 0,01. & azotate argenti præcipitatum cinereum, in lamella vitrea supra ignem odorem empyreumaticum spargens, quo manifestatur extractum vegetabile: id igitur coctione cum acido azotico conc. destruebatur; quod hujus acidi supererat, ammoniaco dein saturabatur, quod primo præcipitatum faciebat, mox solvebat; quapropter acidum muriaticum ad saporem acidulum addebatur. Murias argenti bene elotus & siccatus niveo fuit colore & pondere = 0,240.

[3] Sales cum extracto conjunctos difficulter crystallisari, notisi mum est.

3. Ex reliqua solutionis parte argentum superfluum muriate ammoniaci præcipitabatur: dein inspissabatur, nihilque acido oxalico tartaricove afficiebatur; quapropter nec kali nec calcem habebat.

4. Residuum ex lotione cum aqua N. 1 cum alcohole eluebatur, quod evaporando dedit refinam odoram fuscam = 0,005.

5. Residuum ex massa alcohole elota N. 4 acido muriatico diluto solvebatur; solutio secernebatur, & quod solutum non erat, aqua eluebatur, quæ dein solutioni admiscebatur. Hæc ad dimidiam partem evaporata ammoniaco præcipitabatur; præcipitatum elotum fuit = 0,15. Reliqua solutio, cum aqua lotionis, carbonete ammoniaci præcipitabatur, quod carbonatem calcis = 0,125 dedit. Calcem fuisse inde colligitur, quod cum acido sulphurico sal difficulter solubile efficiebat, nec carbonare ammoniaci solvebatur; ideoque magnesia non erat.

6. Quod ammoniaco præcipitatum erat, in acido sulphurico solvebatur; residua erat magnesia, quæ acid. sulph. dilato difficulter solvitur, si pura est; pondus erat = 0,03. Acido muriatico soluta carbonate ammoniaci procipitabatur [4] & mox ab eo solvebatur; quæ magnesiæ nota est.

[4] BERGMAN & secundum eum plures alii, magnesiæ ad acida attractionem majorem statuunt quam ammoniaci. Alii negant; cum ex acid. sulphurico ammoniaco præcipitetur. BERGMAN (In Opusculis T. 3 p. 317 & 337) hoc præcipitatum inde oriri contendit quod in solutione sal tripliciter compositum generaretur. Qua de re hæc sequentia ipse sum expertus. Si Murias magnesiæ cum carbonate kali præcipitatur, usque dum reagat alcali, & præcipitatum inde separatur, præcipitari dein potest cum ammoniaco puro nova magnesiæ portio. Idem evenit, si ordine inverso primo adhibetur ammoniacum purum & deinde Carbonas kali. Sulphas magnesiæ carbonate kali totus decomponitur; at si plus carbonatis kali additur, solvitur iterum praecipitatum, & post horas quasdam crystalli formantur. Idem evenit, si præcipitatio ope carbonatis ammoniaci perficitur. Etjam ex muriate magnesiæ præcipitando formantur hi sales; si solutio valde diluta est, nihil carbonate ammoniaci praecipitatur; si aliquantom puri ammoniaci additur, præcipitatum oritur quod carbonate ammoniaci, si sufficiens ejus quantitas adsit, solvitur & crystallisatur eam in formam, quam BERGMAN, Opusc. T. 1 Tab. 1. depinxit & carbonatis magnesiæ esse dixit; sed. ut ex allatis sequitur, ammoniacum etjam continet, quod in auctiore calore effugit, & magnesiæ carbonatem pulverulentum relinquit. Solutio muriatis magnesiæ valde diluta non præcipitatur carbonate ammoniaci, sed tantum si concentrata sit; tum autem præcipitatum est triplex ille sal, cujus supra mentionem fecimus, sere difficulter

solubilis. Carbonates alcalium solvunt carbonatem magnesiæ, & efficiunt sales crystallisabiles difficulter solubiles. Murias ammoniaci carbonatem magnesiæ solvit, sed pars decomponitur & sal triplex nascitur. Alcalia pura solvunt carbonatem magnesiæ ita, ut se acido carbonico saturent, & quod superest carbonatis magnesiæ solvant; quod de ammoniaco non valet; cum carbonas ammoniaci puram magnesiam ita solvat, ut hæe primum ab ammoniaco rapiat ad se acidum carbonicum. Fourcroy & Vauquelin, in analysi urinæ, Bulletin des Sciences An. 1798 N. IX, propensitatem magnesiæ ad triplicem conjunctionem cum ammoniaco & acido phosphorico memoraverunt. Hæc magnesiæ proprietas accuratiore disquisitione digna esse vi detur.

Solutio in acido sulphurico facta, ad siccum evaporabatur; quod dum fiebat, crystalli sulphatis calcis formabantur: massa sicca ustulabatur donec effugisset ac. sulphuricum; residui pondus = 0,125; quæ ponderis auctio majori ferri oxidationi tribuenda esse videretur, quam etjam color & vapores acidi sulphurosi indicabant.

7. Massa usta lavabatur aqua, ex qua nec ammoniacum nec carbonates alcalium aliquid præcipitabant. Dein ac. muriatico solvebatur, ex qua solutione murias barytæ præcipitatum effecir, quod sulphatem calcis = 0,02 adhuc remansisse indicabat. Etjam oxalas kali calcis præsentiam docebat. Puro ammoniaco oxidum ferri purum præcipitabatur = 0,10.

8. Solutio N. 5, ex qua calx carbonate ammoniaci præcipitate erat, in siccum evaporabatur; cum acido sulphurico miscebatur & urebatur donec acid, muriaticum effugisset; iterum solvebatur, & ammoniaco præcipitabatur; quo secernebatur magnesia = 0,02.

9. Quod post solutionem in acido muriatico supererat, aqua difficulter solvebatur; at aqua postquam diutius superinfusa mansisset, & solutione barytæ & acid. oxalico præcipitabatur; coctum in carbonate natri generavit sulphatem natri, & quod non solvebatur, effervescebat aliquantulum, adfuso acido quodam; fuit igitur sulphas calcis = 0,140.

Hæ omnes rationes si conferuntur; animadvertitur auctio = 0,040, quæ tribuenda est iis particulis, quæ ex vase, in quo facta erat evaporatio, acido muriatico eluebantur.

Salis N. 2 pondus erat = 0,150; murias argenti = 0,240 continet ac. muriaticum = 0,043, quod ad plenam saturarionem requirit natrum = 0,065 & aquam ad crystallisandum = 0,022, quo quantitas muratis narri invenitur = 0,130. Sulphas barytæ, ibidiem, = 0,010 continet ac. sulphuricum = 0,003; quod saturatur natro = 0,005, ex quo quantitas sulphatis natri = 0,08. Residuum fuit extractum & aqua & alcohole solubile = 0,012.

Sequens tabula exhiber, quantum ex meis quidem experimentis concludere licuit, quantitates corporum in quovis hujus aquæ cantharo solutorum; cui adjungitur tabula Cel. Prof. BERGMAN, loco supra citato allata.

Secundum experimenta BERGMANNI		Secundum mea
Gas acidi carbonici	6 p. c.	Gas ac. carb.
Gas hydr. sulph.	8	cum gase hydr. sulph. - 6 p. c.
		Aër athmosph. - 0,5
	14	6 1/2

Murias natri	- 0,005	Murias natri	- 0,026
Oxidum ferri	- 0,056	Oxid. ferri	- 0,020
Extractum mucil.	- 0,019	Extract. muc.	- 0,003
- - - -		Sulphas natri	- 0,001
- - - -		Sulphas calcis	- 0,037
- - - -		Carbonas calc.	- 0,025
- - - -		Carb. magnes.	- 0,010
- - - -		Resinæ	- 0,001
Murias calcis	- 0,009	-	- -
	0,089		0,123

Fons Medius

In ipso fere plano soli circumjacentis scatet; reliqui duo depressiores. Aqua per duo foramina crateris emittitur, ideoque fere semper turbida est. Temperatura variat. D 1 Junii erat in fundo +7°; in superficie 7,°5; in atmosphæra 8° vel 9° D. 30 Julii in fundo 9,5 in superficie 10,° in atmosphæra 19° vel 20°. Quantitas gasium per cantharum aquæ hujus fontis est 1 1/2 p. cub. major, quam reliquorum; odore hydrogenii sulph. fortiori & quadam virtute laxante prædita est. Ejus partes constitutivæ eædem sunt, ac fontis supra descripti, excepto, quod minus ferri (= 0,015) & carbonatis calcis (= 0,080) habet, quod etjam quantitatem acidi carbonici minorem indicare videtur.

Fons supremus.

Situs hujus fontis editior est, quam ceterorum. Sapor veteris fontis sapori similis est. Reactio eadem. Temperatura variat. D. 1 Jun. erat in fundo + 6,°5; in superficie 7.° D. 30 Jul. in fundo + 8° in superficie 9.° Ferri quantitas eadem est ac in vetere fonte, sulphatis calcis major (= 0,045); carbonatis calcis & magnesiæ minor. Sales reliqui sunt iidem in omnibus his fontibus.

Limus Medeviensis.

Non admodum profunde sub ipsa soli superficie reperitur. Scripturam azotate plumbi factam afficit. Schidiis & aliis reliquiis vegetabilibus immixtus est. Ustione duas partes tertias ponderis perdit; residuum constat ex ferro, silice & sulphate calcis. Sulphatem ferri, ut limus Lokaënsis, non continet. Una ejus tertia pars est extractiva, & alkohole & aqua solubilis.

Fons Lokaënsis.

Ejus partes constitutivas eadem fere ratione, qua fontium Medeviensium, exploratas has sequentes reperi.

Gas Hydrog. sulph. & perpaullulum	
Gasis acidi carbonici - - 2 p. c.	
Aër atmospæricus - - 3,5	
ex quo gas oxigenium - 0,5	
& gas azotum - 3,0	
	5,5 p. c.
Carbonas calcis - - 0,0042	
Carbonas magnesiæ - - 0,0035	
Silex - - 0,0107	
Sulphas calcis - - 0,0023	
Murias natri - - 0,0055	
Extractivum - - 0,0014	
Aliquantulum resinæ - -	
per Cantharum	0,0276

Limus Lokaënsis,

In quaque libra continentur	
Gas ac. carb. & hydrog. sulph. - 2,6	
Aër atmosphæricus - 0,3	
Gas hydrogenium carbonatum - 0,8	
	3,7 p. cub.
Aquosum - 9,5 lod.	
Limus siccatus = 4, continet	
Extractum - 0,045	
Sulphas calcis - 0,010	
Sulphas ferri - 0,005	
Combustibilia - 1,402	
Oxidum ferri - 0,172	
Argilla - 0,075	
Carbonas magnesiæ - 0,020	
Silex - 2,232	
Aliquantulum carb. calcis -	
	3,961
Addito quod deficit	0,039
	4,000

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