

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

MEASURAND : Mass fraction of folic acid in the CCQM-K55.d samples

$x_i$  : result of measurement carried out by laboratory  $i$

$u_i$  : combined standard uncertainty of  $x_i$

	$x_i$ / (mg/g)	$u_i$ / (mg/g)	General approach
BAM	900.95	0.36	qNMR
BIPM	911.1	2.15	MB <sup>1</sup> , qNMR <sup>2</sup>
CENAM	935.4	5.17	MB
GLHK	909.6	1.99	MB
HSA	910.8	2.4	MB
INMETRO	900.3	4.2	MB, qNMR
KRISS	912.9	0.27	MB
LGC	902.9	1.6	MB, qNMR
NIM	905.2	5.27	MB <sup>1</sup> , qNMR <sup>2</sup>
NIMT	911	5.18	MB
NIST	905.9	1.6	MB, qNMR
NMIA	903	4	MB, qNMR
NMIJ	898.6	7.7	MB, qNMR
NMISA	906.8	2.6	MB <sup>1</sup> , qNMR <sup>2</sup>
NRC	858.3	6.3	qNMR
SIRIM	902	2	qNMR
UME	911.365	3.62	MB <sup>1</sup> , qNMR <sup>2</sup>
VNIM	912.07	1.56	MB

(1) CCQM-K55.d

(2) CCQM-P117.d

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

**MEASURAND** : Mass fraction of total related structure impurity content in the CCQM-K55.d samples

$x_i$  : result of measurement carried out by laboratory  $i$

$u_i$  : combined standard uncertainty of  $x_i$

Lab $i$	$x_i$ / (mg/g)	$u_i$ / (mg/g)
BIPM	10.37	0.89
CENAM	0.433	0.021
GLHK	11.87	1.26
HSA	7.71	0.314
INMETRO	15.57	4
KRISS	11.6	0.2
LGC	12.42	2
NIM	13.41	4
NIMT	16.69	0.17
NIST	13.68	2.1
NMIA	14.4	1
NMIJ	7.24	0.11
NMISA	10.5	1.4
UME	11.31	0.244
VNIIM	12.2	1.51

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

MEASURAND : Mass fraction of water in the CCQM-K55.d samples

$x_i$  : result of measurement carried out by laboratory  $i$

$u_i$  : combined standard uncertainty of  $x_i$

Lab $i$	$x_i$ / (mg/g)	$u_i$ / (mg/g)
BAM	77.5	0.2
BIPM	79.3	1.9
CENAM	64.4	5.17
GLHK	78.4	1.16
HSA	81.08	1.94
INMETRO	78.5	0.56
KRISS	76.06	0.21
LGC	79.52	1.61
NIM	78.7	3.37
NIMT	72	5.15
NIST	77	0.18
NMIA	79	2
NMIJ	79.81	1.35
NMISA	79	2.1
NRC	77.5	1.2
SIRIM	81.31	2.368
UME	75.225	1.597
VNIM	75.61	0.39

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

MEASURAND : Mass fraction of volatile organic content in the CCQM-K55.d samples

$x_i$  : result of measurement carried out by laboratory  $i$

$u_i$  : combined standard uncertainty of  $x_i$

	$x_i$ / (mg/g)	$u_i$ / (mg/g)
BAM	0.1	+ 0, - 0.1
BIPM	0	+ 0.1, - 0
GLHK	0	+ 1, - 0
HSA	0	+ 0.58, - 0
IRMM	0	+ 0.16, - 0
KRISS	0	+ 0.02, - 0
LGC	0	+ 1.1, - 0
LNE	0	+ 0.82, - 0
NIM	0.02	0.011
NIMT	0.01	+ 0.3, - 0
NIST	0.16	0.03
NMIJ	0.0017	0.0007
NMISA	0	+ 0.75, - 0
VNIIM	0.02	+ 0.1, - 0

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

MEASURAND : Mass fraction of non-volatile content in the CCQM-K55.d samples

$x_i$  : result of measurement carried out by laboratory  $i$

$u_i$  : combined standard uncertainty of  $x_i$

	$x_i$ / (mg/g)	$u_i$ / (mg/g)
<b>BIPM</b>	0.4	0.2
<b>GLHK</b>	0.17	1
<b>HSA</b>	0	+ 1.44, - 0
<b>INMETRO</b>	0.211	0.017
<b>KRISS</b>	0.33	0.11
<b>LGC</b>	0.429	0.107
<b>NIM</b>	1.18	0.59
<b>NIMT</b>	0	0.52
<b>NIST</b>	0.27	0.05
<b>NMIA</b>	< 2	+ 0, - 1.2
<b>NMIJ</b>	0.35	0.43
<b>NMISA</b>	3.2	0.59
<b>NRC</b>	0.28	+ 0.31, - 0.28
<b>UME</b>	< 1	+ 0, - 0.6
<b>VNIIM</b>	0.076	0.0035

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

MEASURAND : Mass fraction of folic acid in the CCQM-K55.d samples

The method to determine the Key Comparison Reference Value  $x_R$  and its associated uncertainty  $u_R$  for the mass fraction of folic acid is described in Section V1 of the CCQM-K55.d Final Report.

$x_R = 906.5 \text{ mg/g}$ ,  $u_R = 4.8 \text{ mg/g}$

MEASURAND : Mass fraction of individual impurity classes in the CCQM-K55.c samples

Key comparison reference values ( $x_R$ ) and associated standard uncertainty ( $u_R$ ) were assigned for the mass fraction of the following impurity classes: total related structure impurity content, water, volatile organic content and non-volatile content. They are consensus values derived from the individual data supplied by each participant.

Total related structure impurity content:  $x_R = 12.6 \text{ mg/g}$   $u_R = 3.1 \text{ mg/g}$

Water:  $x_R = 78.0 \text{ mg/g}$   $u_R = 1.6 \text{ mg/g}$

Volatile organic content:  $x_R = 0.374 \text{ mg/g}$   $u_R = 0.083 \text{ mg/g}$

Non-volatile content:  $x_R = 0.3 \text{ mg/g}$   $u_R = 0.2 \text{ mg/g}$

The degree of equivalence of laboratory  $i$  with respect to each key comparison reference value is given by a pair of terms, both expressed in mg/g:

$D_i = (x_i - x_R)$  and its expanded uncertainty ( $k = 2$ ),  $U_i = 2(u_R^2 + u_i^2)^{1/2}$

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

#### Degrees of equivalence for mass fraction of folic acid

Lab *i*



	$D_i$ / (mg/g)	$U_i$ / (mg/g)
NRC	-48.2	15.8
NMIJ	-7.9	18.1
INMETRO	-6.2	12.8
BAM	-5.5	9.6
SIRIM	-4.5	10.4
LGC	-3.6	10.1
NMIA	-3.5	12.5
NIM	-1.3	14.3
NIST	-0.6	10.1
NMISA	0.3	10.9
GLHK	3.1	10.4
HSA	4.3	10.7
NIMT	4.5	14.1
BIPM	4.6	10.52
UME	4.9	12.0
VNIIM	5.6	10.1
KRISS	6.4	9.6
CENAM	28.9	14.1

## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

#### Degrees of equivalence for total related structure impurity content

Lab *i* ↓

	$D_i$ / (mg/g)	$U_i$ / (mg/g)
CENAM	-12.17	6.28
NMIJ	-5.37	6.28
HSA	-4.90	6.31
BIPM	-2.24	6.52
NMISA	-2.11	6.87
UME	-1.30	6.29
KRISS	-1.01	6.29
GLHK	-0.74	6.76
VNIIM	-0.41	6.96
LGC	1.19	7.44
NIM	2.30	10.18
NIST	2.59	7.55
NMIA	3.19	6.59
NIMT	4.08	6.28
INMETRO	4.69	10.17

#### Degrees of equivalence for water

Lab *i* ↓

	$D_i$ / (mg/g)	$U_i$ / (mg/g)
CENAM	-13.57	10.84
NIMT	-5.97	10.80
UME	-2.75	4.56
VNIIM	-2.36	3.35
KRISS	-1.91	3.29
NIST	-0.97	3.28
BAM	-0.47	3.28
NRC	-0.47	4.05
GLHK	0.43	4.00
INMETRO	0.53	3.45
NIM	0.73	7.49
NMIA	1.03	5.16
NMISA	1.03	5.32
BIPM	1.33	5.01
LGC	1.55	4.58
NMIJ	1.84	4.23
HSA	3.11	5.07
SIRIM	3.34	5.75



## Key comparison CCQM-K55.d

### Mass fraction of Folic acid and purity assessment

#### Degrees of equivalence for volatile organic content

Lab *i* ↓

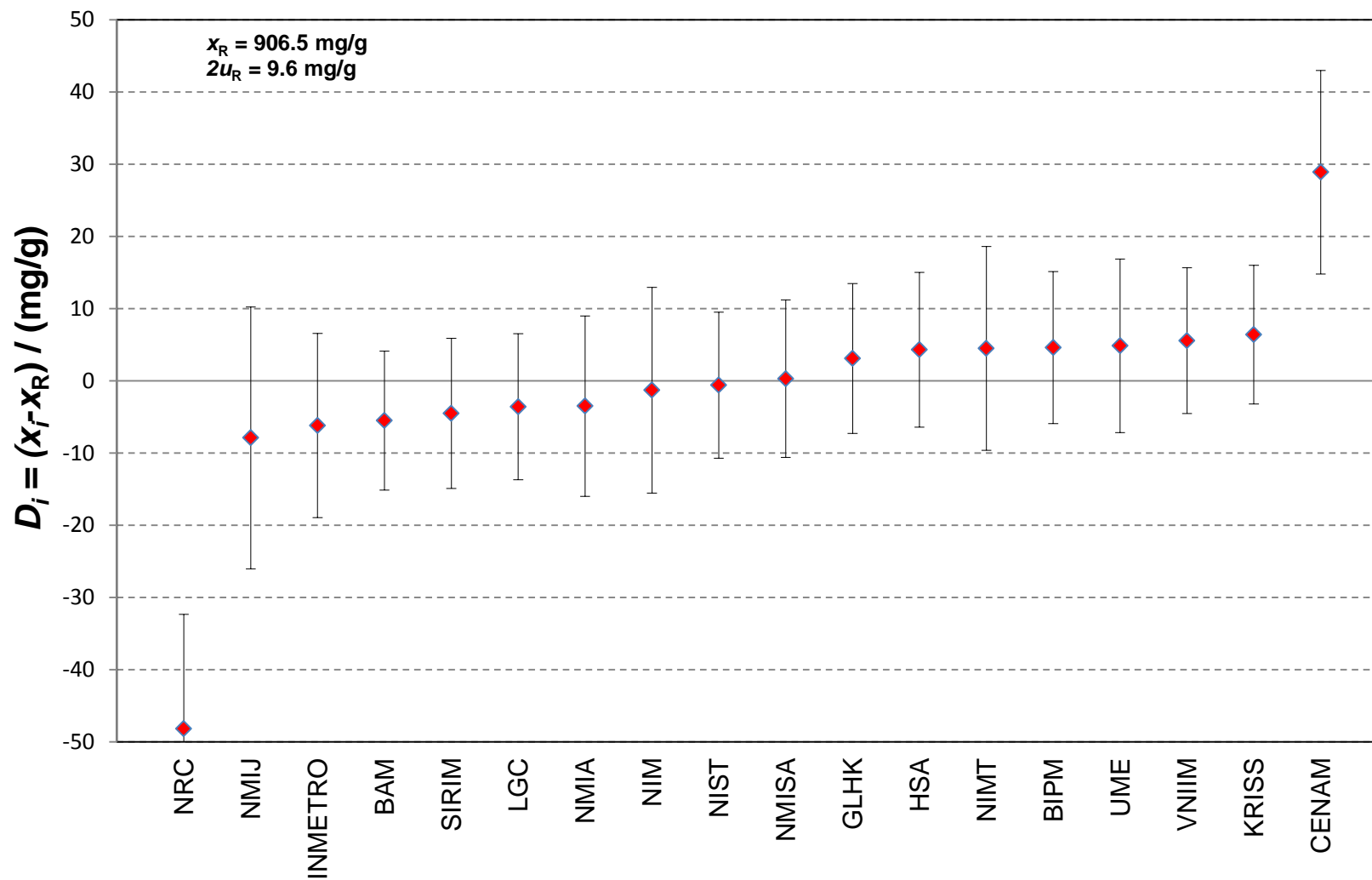
	$D_i$ / (mg/g)	$U_i$ / (mg/g)
BAM	-0.37	0.17
BIPM	-0.37	-0.17, +0.34
CENAM	-0.37	0.17
KRISS	-0.37	-0.23, +0.17
NIMT	-0.37	0.17
NIM	-0.36	0.17
NIST	-0.36	0.17
VNIIM	-0.33	0.17
NMIJ	-0.32	0.18
GLHK	-0.27	-0.26, +0.17
NRC	-0.08	0.18
LGC	0.00	0.57
HSA	0.00	0.35
INMETRO	0.09	0.17
NMISA	0.13	0.29
UME	0.13	-1.01, +0.17
NMIA	0.53	0.74

#### Degrees of equivalence for non-volatile content

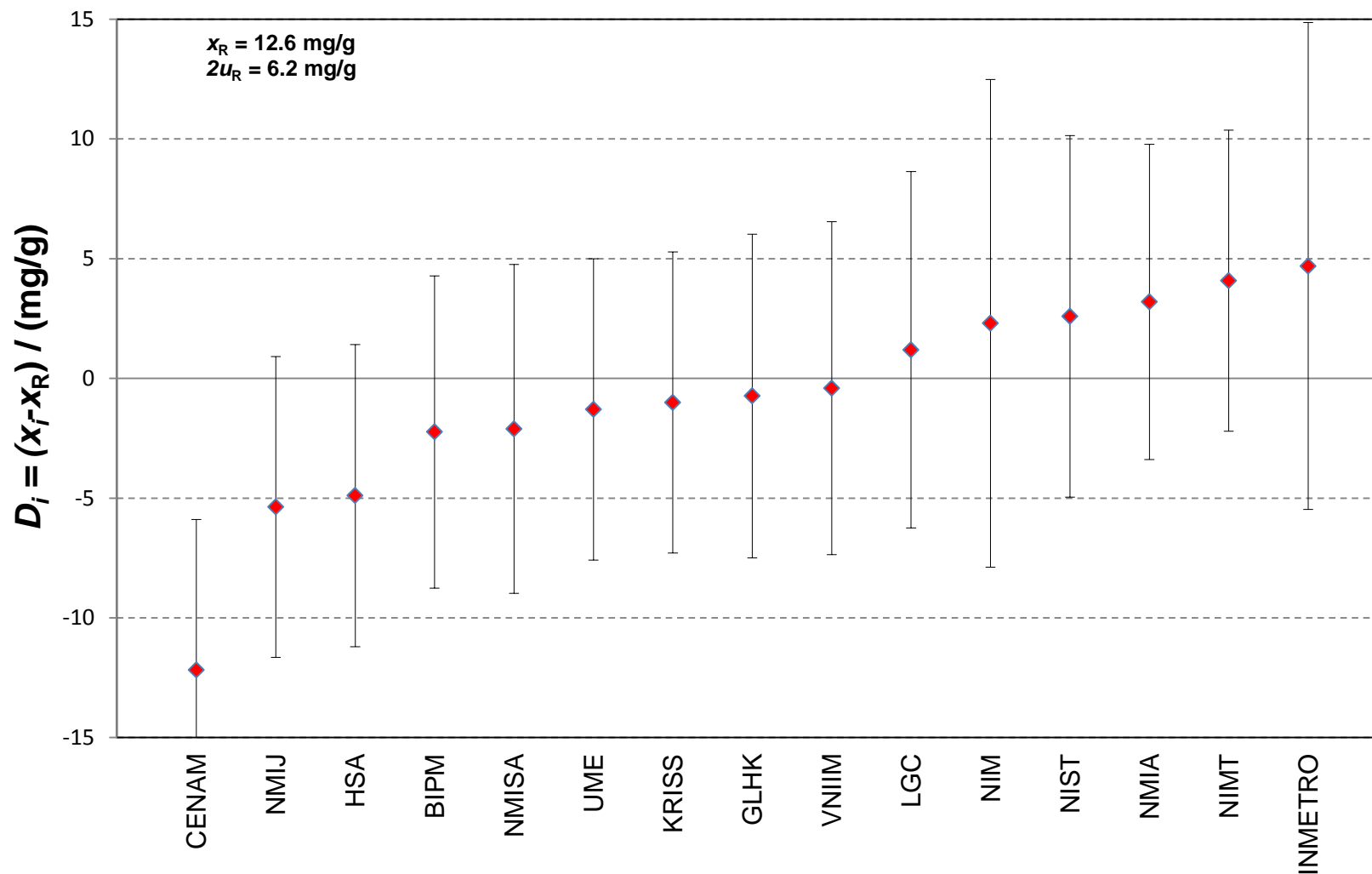
Lab *i* ↓

	$D_i$ / (mg/g)	$U_i$ / (mg/g)
HSA	-0.31	-0.49, +2.91
NIMT	-0.31	1.12
VNIIM	-0.23	0.41
GLHK	-0.14	2.04
CENAM	-0.13	0.41
INMETRO	-0.09	0.41
NIST	-0.04	0.42
NRC	-0.03	-0.69, +0.74
KRISS	0.03	0.46
NMIJ	0.05	0.95
BIPM	0.10	0.57
LGC	0.12	0.46
UME	0.70	-1.27, +0.41
NIM	0.88	1.25
NMIA	1.70	-2.43, +0.41
NMISA	2.90	1.25

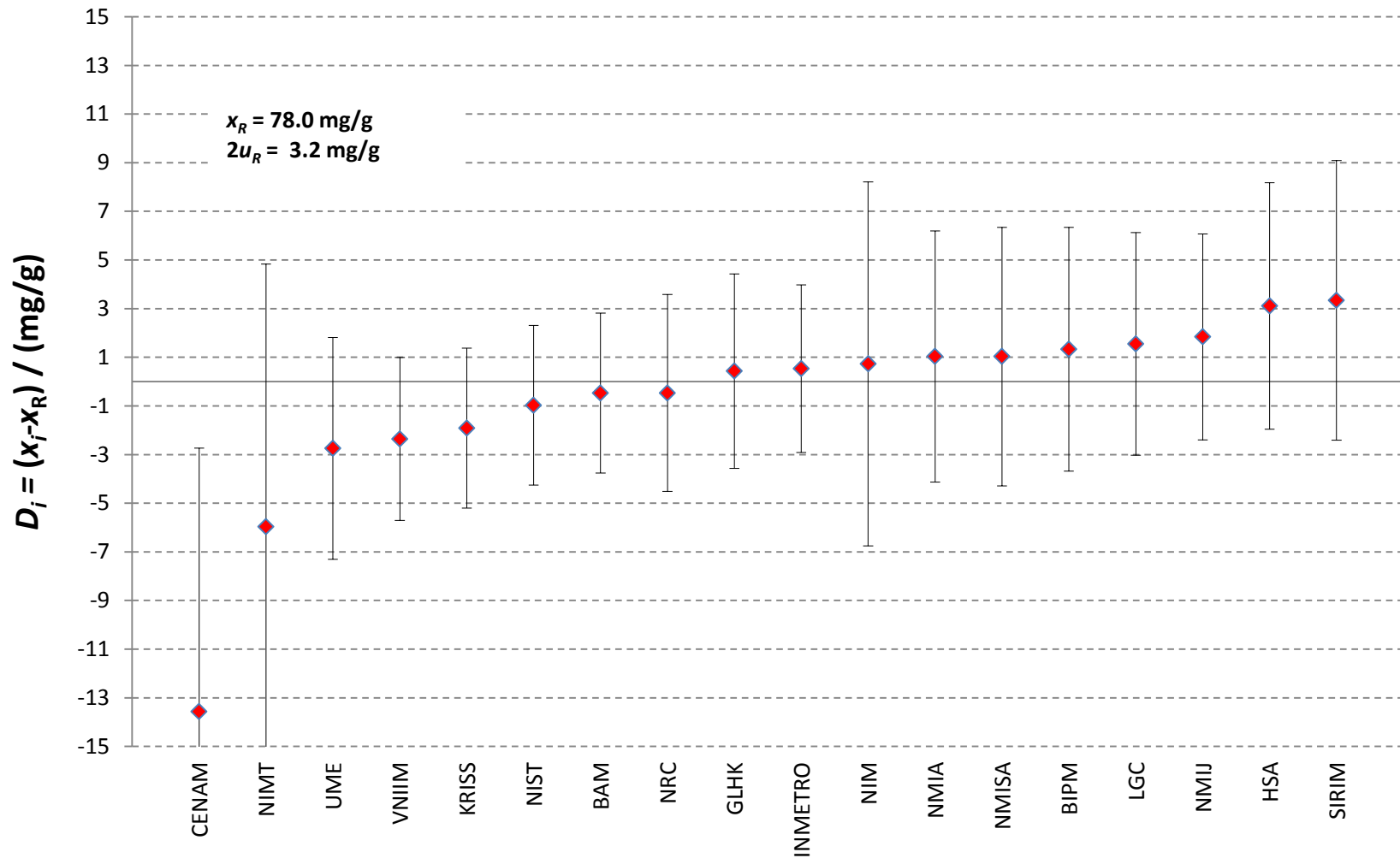
**CCQM-K55.d : Mass fraction of folid acid**  
**Degrees of equivalence,  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )**



**CCQM-K55.d : Mass fraction of total related structure impurities**  
**Degrees of equivalence,  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )**

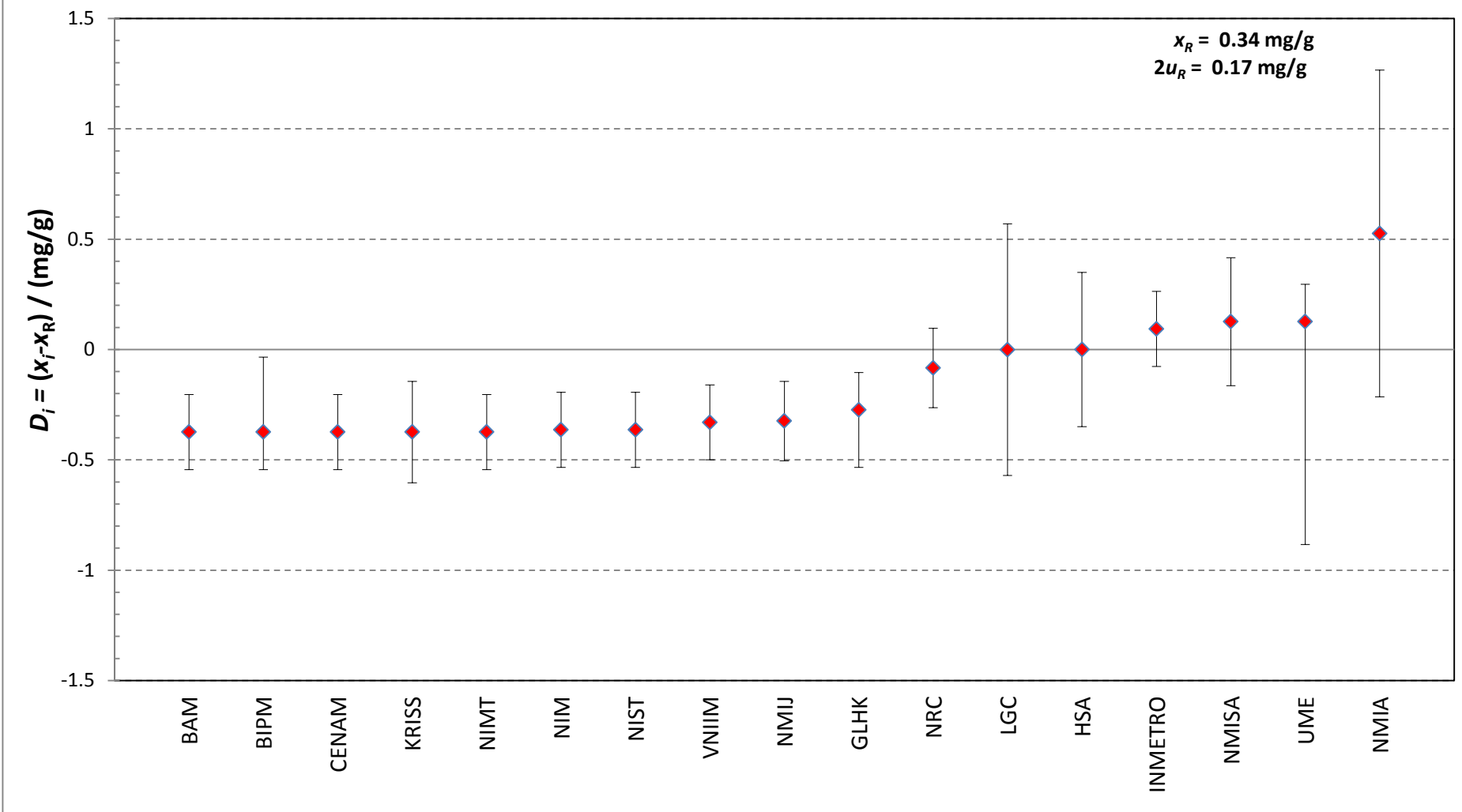


**CCQM-K55.d : Mass fraction of water**  
 Degrees of equivalence,  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



### CCQM-K55.d : Mass fraction of volatile organic content

Degrees of equivalence,  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )



### CCQM-K55.d : Mass fraction of non-volatile content

Degrees of equivalence,  $D_i$  and expanded uncertainty  $U_i$  ( $k = 2$ )

