The Redesigned AFMAT

Crack Growth Rate Database

Cordell E. Smith
James A. Harter
Alexander V. Litvinov

LexTech, Inc.
8285 Rhine Way
Centerville, OH 45458

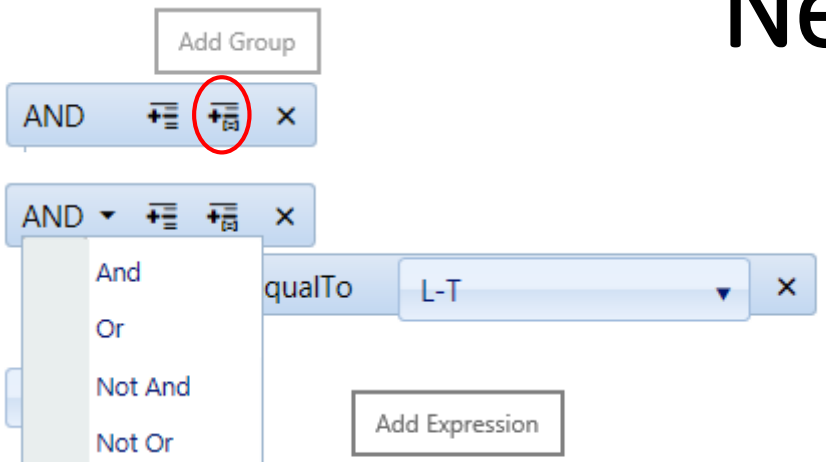
New Features

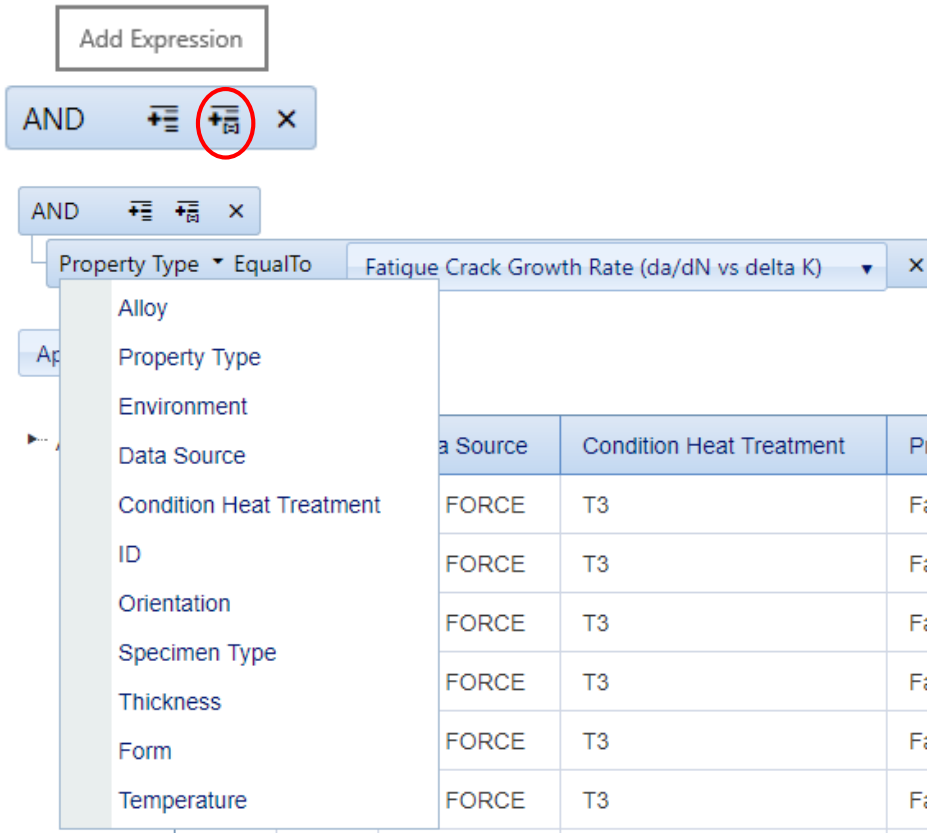
I. Expanded test profile search criteria
II. New favorites tab
III. Updated crack growth rate plot
IV. New crack growth rate data
V. Downloadable tabular look up material data files

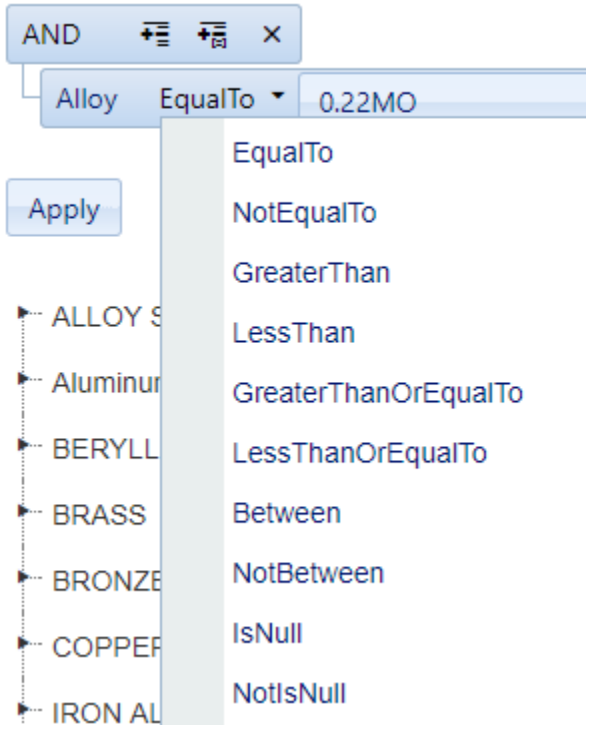
Expanded Search Criteria For The Test Profile

- Users can now search for data by orientation

New Search Format

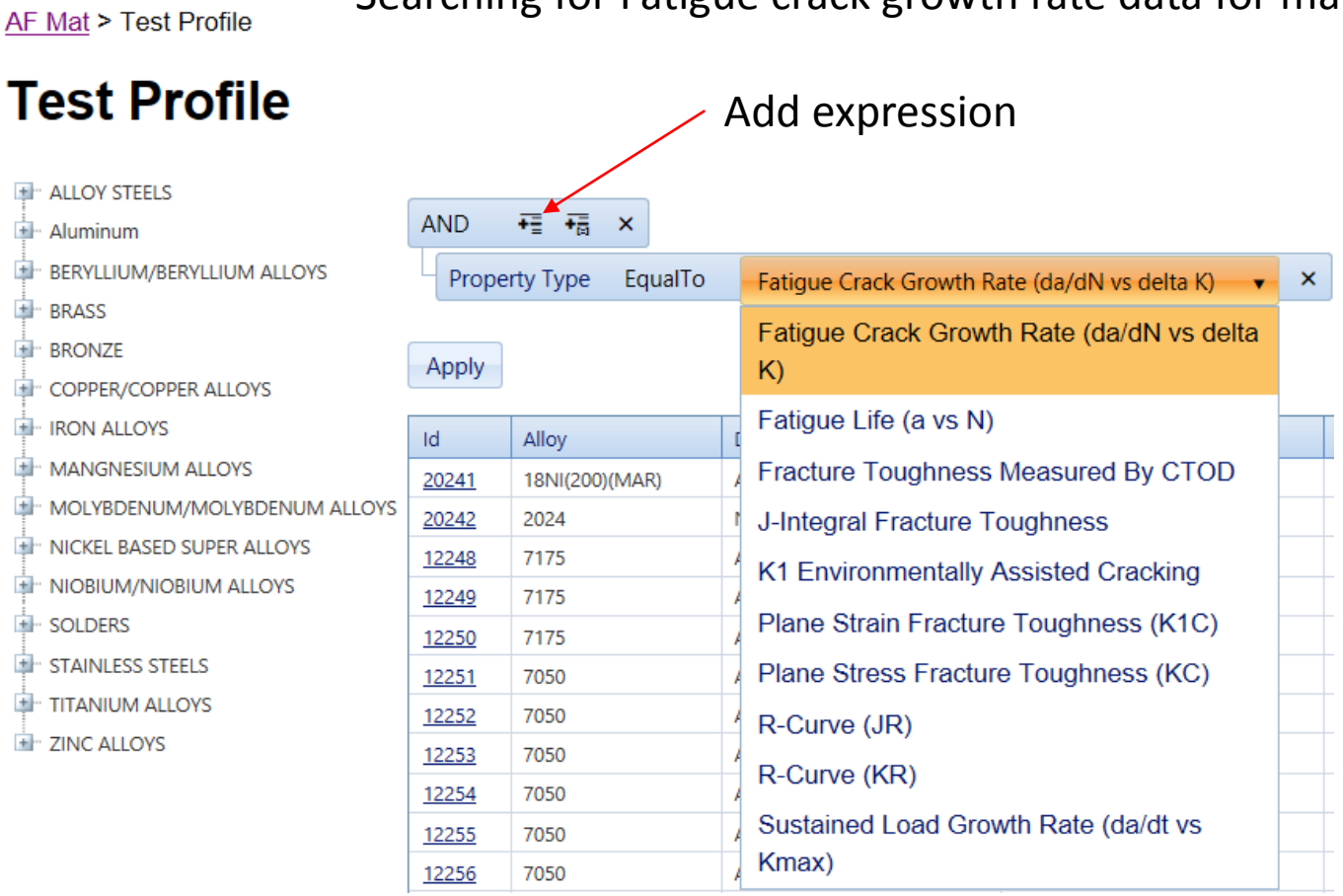


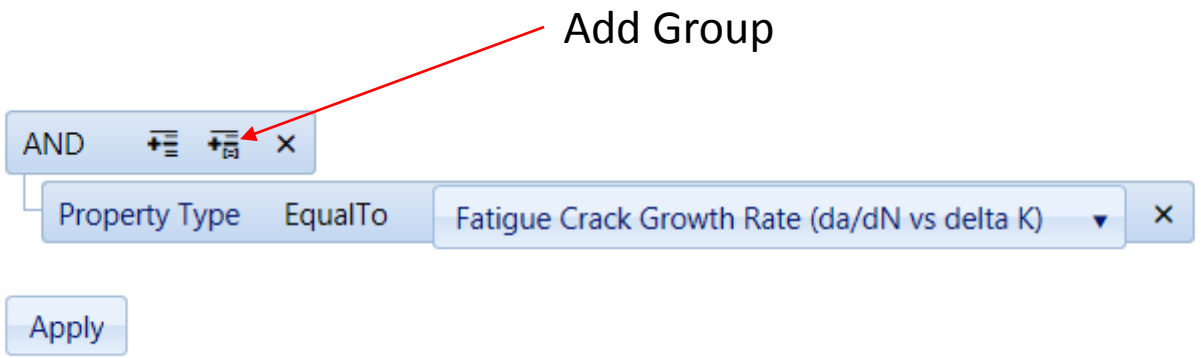


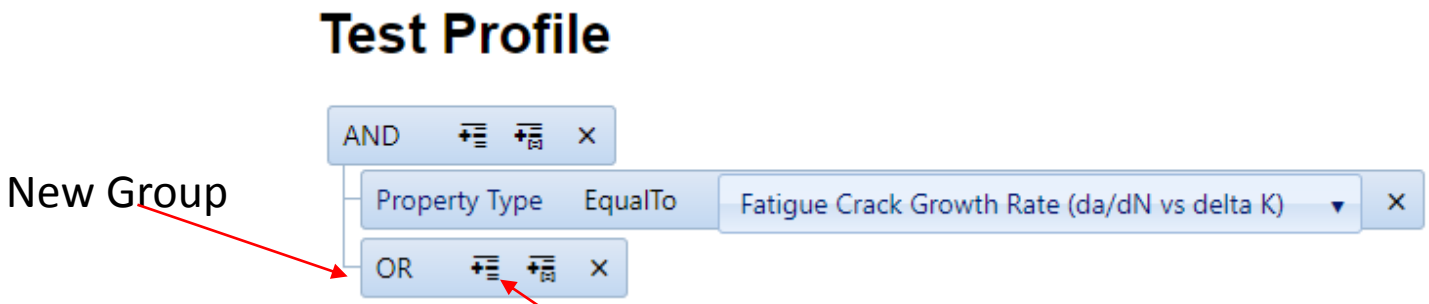


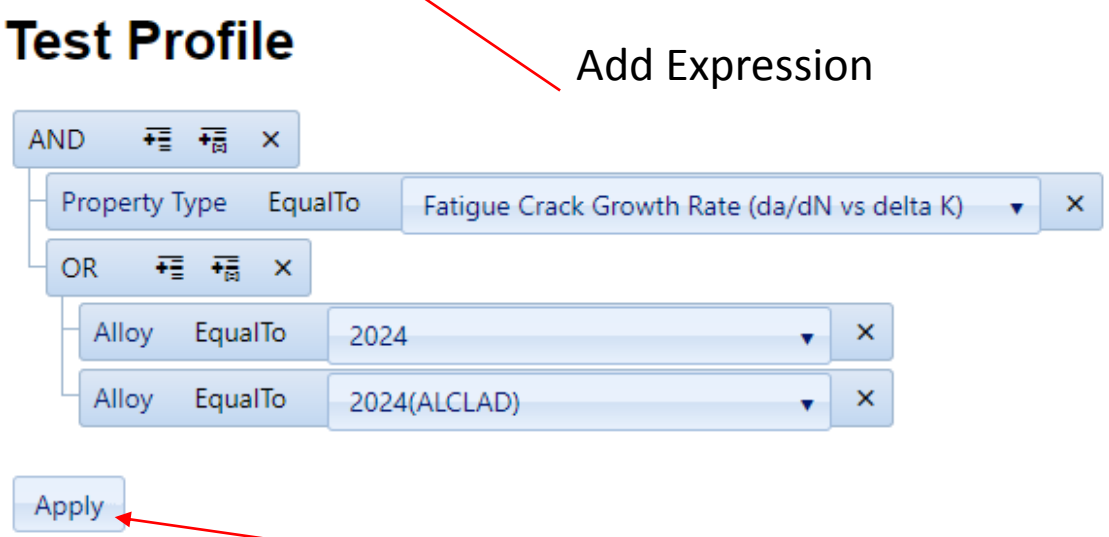
Performing a Typical Database Search

Searching for Fatigue crack growth rate data for materials 2024 and 2024(ALCLAD)




Add Group
AND
Property Type EqualTo Fatigue Crack Growth Rate (da/dN vs delta K)
Apply


Test Profile
New Group
AND
Property Type EqualTo Fatigue Crack Growth Rate (da/dN vs delta K)
OR


Test Profile
Add Expression
AND
Property Type EqualTo Fatigue Crack Growth Rate (da/dN vs delta K)
OR
Alloy EqualTo 2024
Alloy EqualTo 2024(ALCLAD)
Apply
Select Apply

Test Profile

AND

Property Type EqualTo Fatigue Crack Growth Rate (da/dN vs delta K)

OR

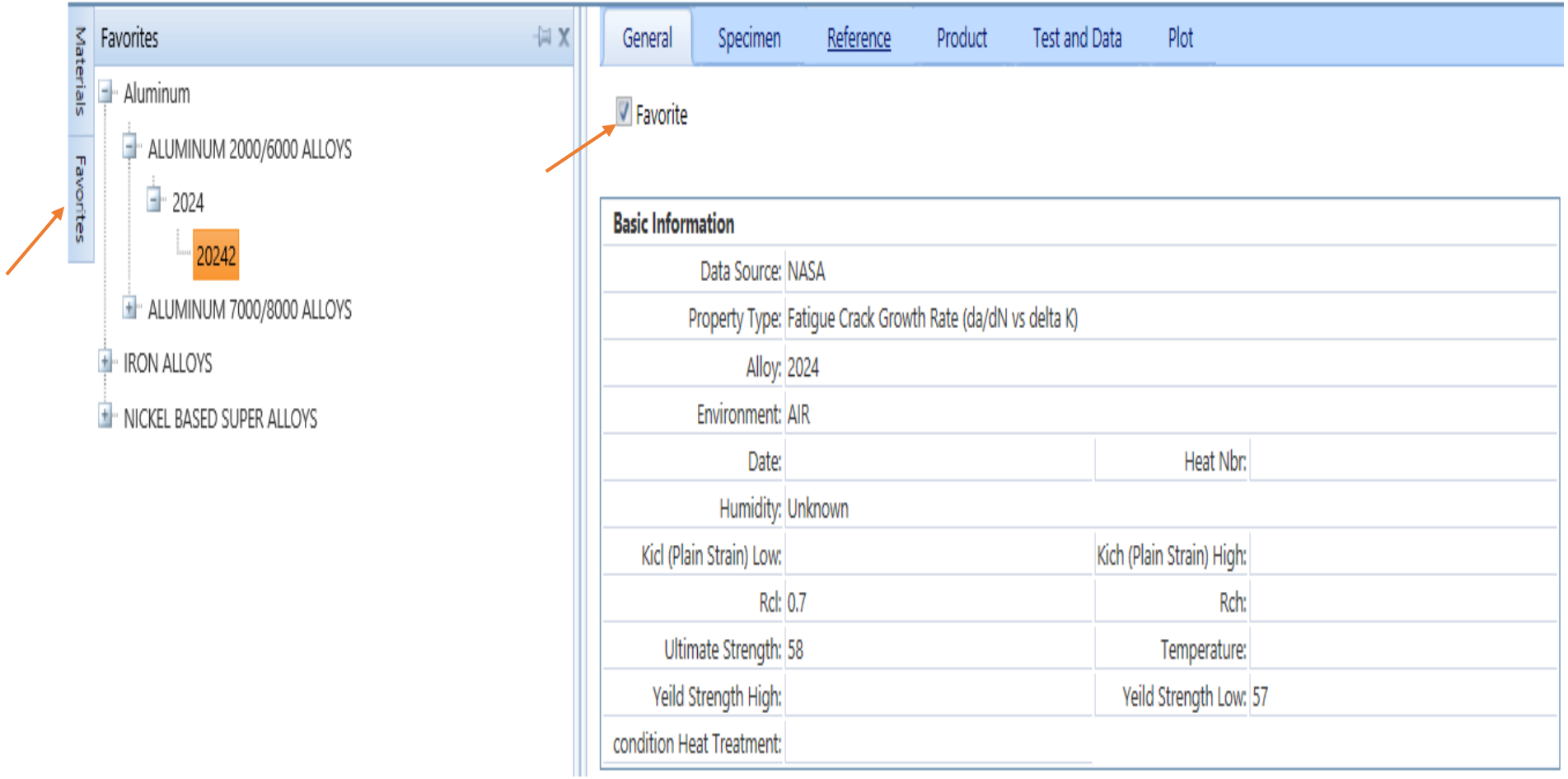
Alloy EqualTo 2024

Alloy EqualTo 2024 (ALCLAD)

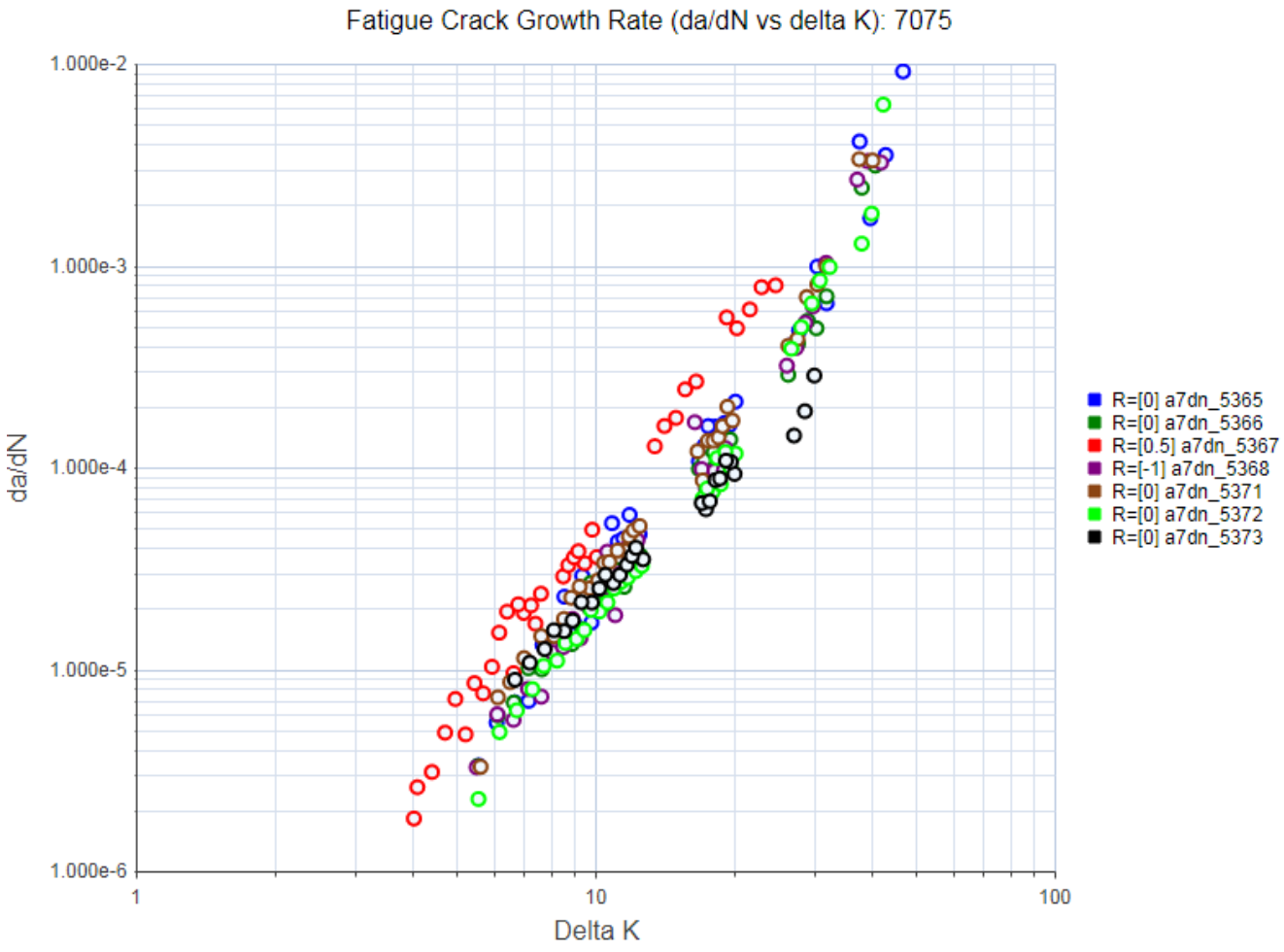
Aluminum

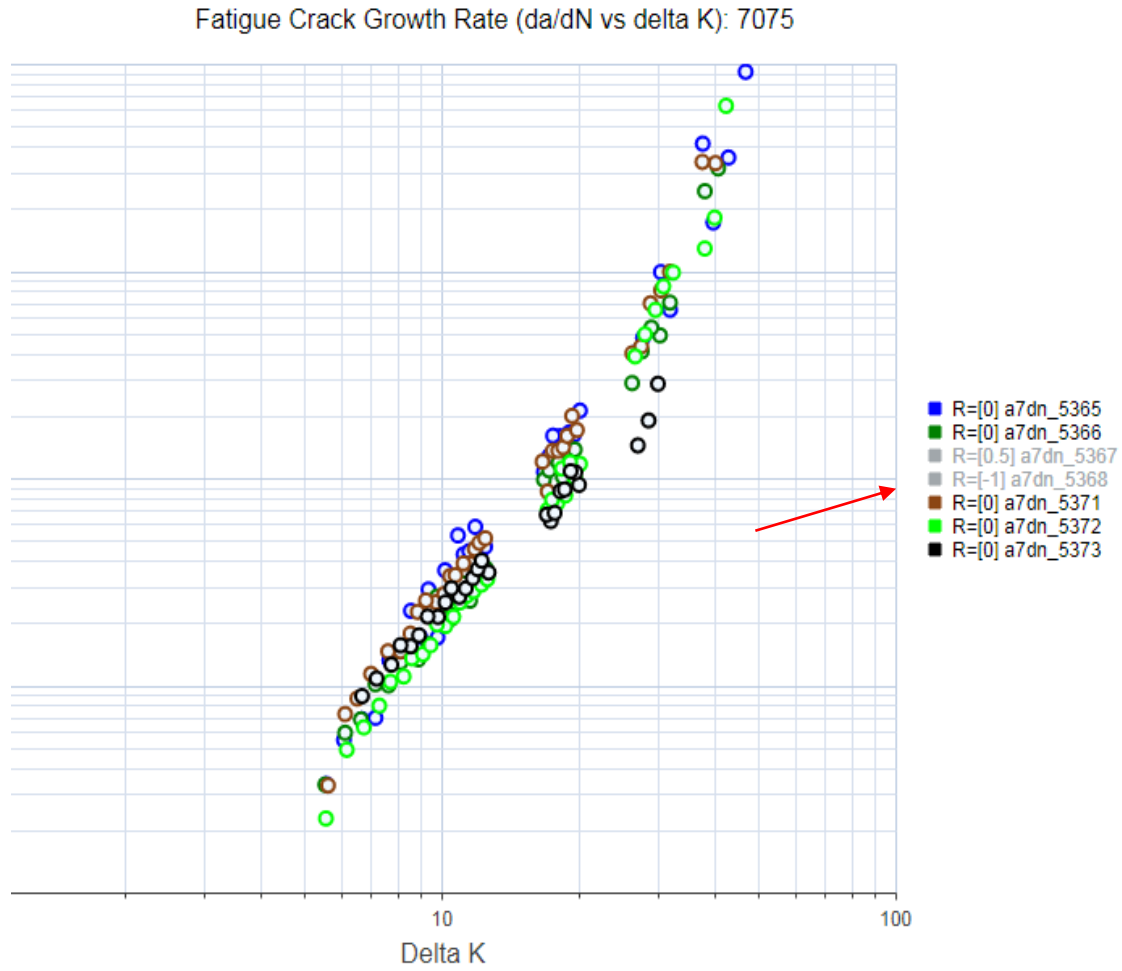
Id	Alloy	Data Source	Condition Heat Treatment	Property Type	Orientation	Specimen Type	Specimen Thickness	Product Form	Environment	Temperature
6899	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.039	Sheet	LAB AIR	70
6900	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.128	Sheet	HHA	70
6901	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.125	Sheet	LAB AIR	75
6902	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.126	Sheet	LAB AIR	75
6903	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.1		DRY AIR	72
6904	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	T-L	Center Cracked Panel (CCP) (Max Stress Specified)	0.09	Sheet	LAB AIR	70
6905	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	T-L	Center Cracked Panel (CCP) (Max Stress Specified)	0.09	Sheet	LAB AIR	70
6906	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	T-L	Center Cracked Panel (CCP) (Max Stress Specified)	0.09	Sheet	LAB AIR	70
6907	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	T-L	Center Cracked Panel (CCP) (Max Stress Specified)	0.09	Sheet	LAB AIR	140
6908	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Stress Specified)	0.25	Plate	LAB AIR	70
6909	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.09	Sheet	LAB AIR	70
6910	2024	AIR FORCE	T3	Fatigue Crack Growth Rate (da/dN vs delta K)	L-T	Center Cracked Panel (CCP) (Max Load Specified)	0.09	Sheet	LAB AIR	70

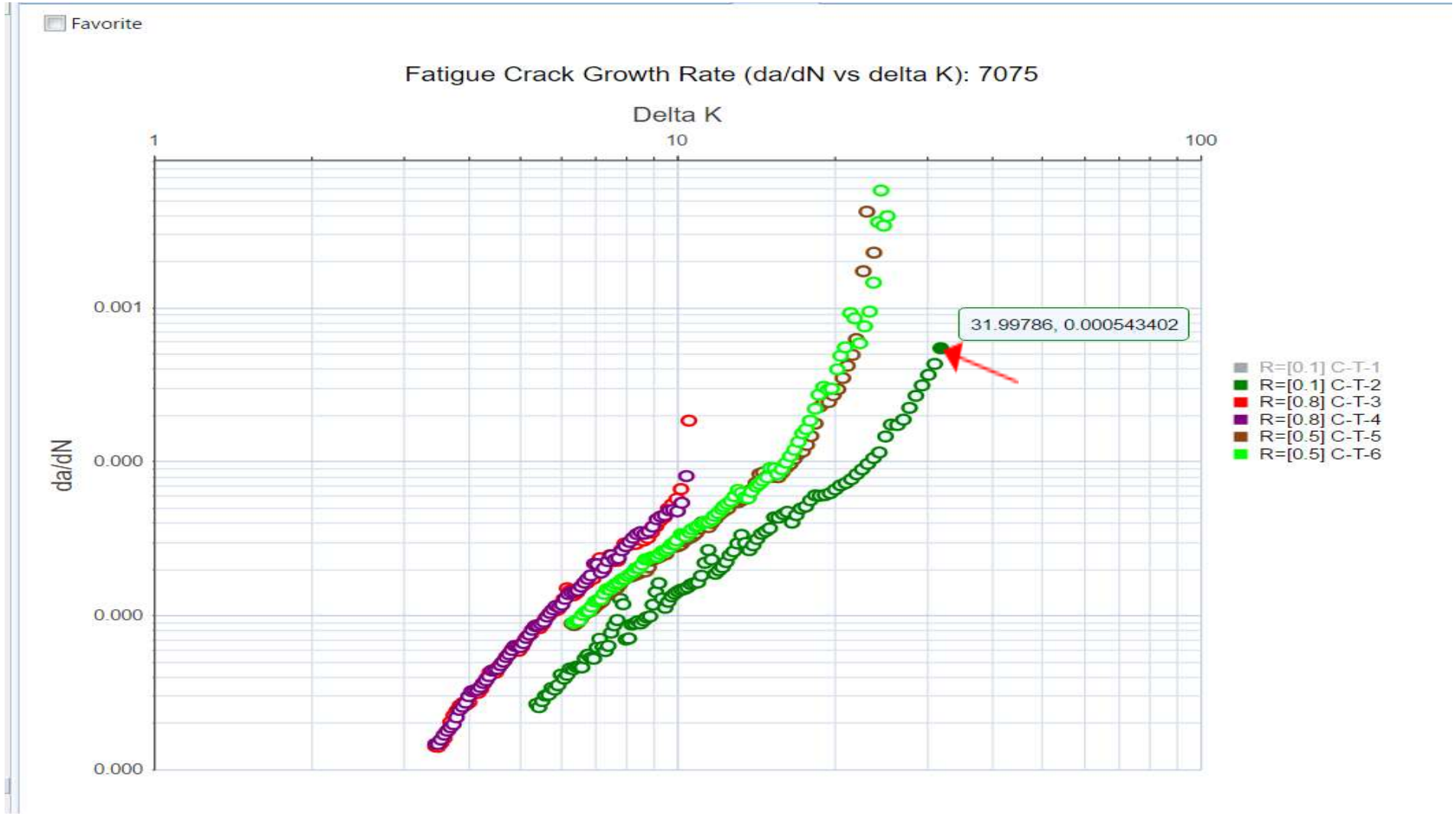
New Favorites Tab



New Plots


Fatigue Crack Growth Rate (da/dN vs delta K): 7075
1.000e-2
1.000e-3
1.000e-4
1.000e-5
1.000e-6
da/dN
1
10
100
Delta K
R=[0] a7dn_5365
R=[0] a7dn_5366
R=[0.5] a7dn_5367
R=[-1] a7dn_5368
R=[0] a7dn_5371
R=[0] a7dn_5372
R=[0] a7dn_5373

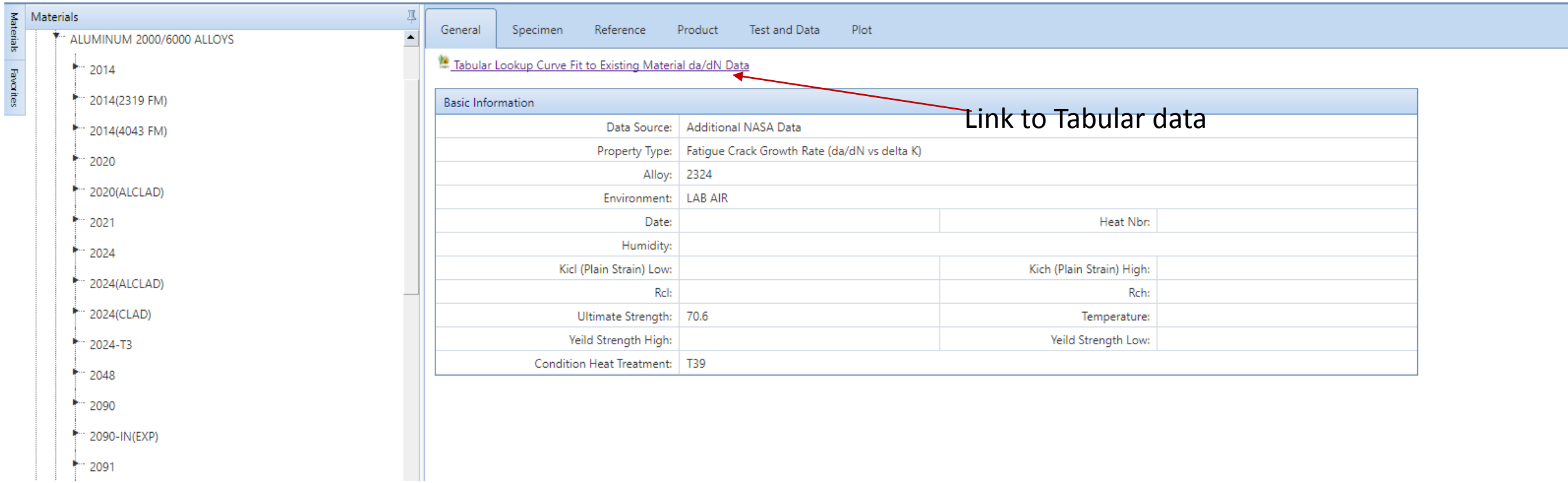

Fatigue Crack Growth Rate (da/dN vs delta K): 7075
10
100
Delta K
R=[0] a7dn_5365
R=[0] a7dn_5366
R=[0.5] a7dn_5367
R=[-1] a7dn_5368
R=[0] a7dn_5371
R=[0] a7dn_5372
R=[0] a7dn_5373


Favorite
Fatigue Crack Growth Rate (da/dN vs delta K): 7075
Delta K
1
10
100
da/dN
0.001
0.000
0.000
0.000
31.99786, 0.000543402
R=[0.1] C-T-1
R=[0.1] C-T-2
R=[0.8] C-T-3
R=[0.8] C-T-4
R=[0.5] C-T-5
R=[0.5] C-T-6

New Test Data

- Over 2,200 test sets have been added to the online crack growth rate data base
- Including materials:
  - 7249 Provided by NRC
  - AMS 6526 and 2224-T3511 Provided by T-38 & A-10

Test Profile



2014-T6 L-T lab air Plate	2090-T86 T-L LAB AIR TEE EXTRUSION	7010-T73651 L-T LAB AIR PLLATE	7050-T73651 L-T LAB AIR PLATE	7075-T76511 L-T LHA EXTRUSION	7475-T7351 L-T LAB AIR PLATE	PH13-8Mo-H1000 L-T Dry air
2020-T651 L-T Lab air Plate	2091-T8 T-L HHA	7049-T7352	7050-T74511 L-T LAB AIR EXTRUSION	7079-T6 L-T LAB AIR SHEET	X7091-T7E70 S-T GN2 Plate	PH13-8Mo-H1050 L-T Lab air Forging
2024-T3 Lab air L-T	2124-T851 L-T LAB AIR PLATE	7050-T74 L-T LAB AIR FORGING	7050-T76511 L-T LAB AIR EXTRUSION	7150-T7751 L-T Lab Air Plate	A356-T6 Lab Air	TI-6AL-4V L-T Lab Air
2024-T3 Lab air T-L	2219-T87 T-L	7050-T74 T-L LAB AIR FORGING	7050-T76511 L-T STW EXTRUSION	7150-T77511 L-T Lab air Extrusion	A357-T6 Lab air Casting	TI-6AL-4V ST(1775F;1hr)
2024-T42 Lab air L-T	2219-T851 L-T DRIY AIR PLATE	7050-T7451 L-T HHA P;ATE	7075-T76 L-T LHA	7175-T74 L-T Lab air Forging	10NI STEEL	TI-6AL-4V(ELI)-RA L-T LAB AIR
2024-T851 Lab air L-T	2324-T39 L-T LAB AIR PLATE	7050-T7451 L-T LAB AIR	7075-T651 L-T Lab Air Plt & Ext	7178-T6 L-T Lab air Sheet	17-7PH RH1100 L-T LAB AIR SHEET	
2024-T351 L-T Lab air Plate	2618-T851 T-L HHA PLATE	7050-T7452 FORGING LAB AIR L-T	7075-T7651 L-T LHA Plate	7249-T76511 Lab Air L-T Extrusion	4130 L-T Lab Air	
2024-T3511 L-T Lab air Plate		7050-T73511 L-T HHA EXTRSION	7075-T73511 L-T Lab air EXTRUSION	7475-T7351 L-T HHA PLATE	4340 L-T Lab air Temp 650	

Tabular Lookup Page

AF Mat > Tabular Lookup da/dN Data

Tabular Lookup da/dN Data

AND

Apply

Materials
- ALLOY STEELS
- Aluminum
- STAINLESS STEELS
- TITANIUM ALLOYS

Material Name	Ultimate Strength	Young's Modulus	Coefficent of Thermal Expansion	Poisson's Ratio	Upper limit on da/dN	Lower limit on da/dN	Plane Stress Fracture Toughness	Yield Strength	Plane Strain Fracture Toughness	Lower limit on R shift	Delta K Threshold value	Upper limit on R shift	Units
2324-T39 lab air & HHA L-T	70	10600	1.24E-05	0.33	0.1	1E-09	78	55	39	-0.33	2.8488	0.7	English
2224-T3511 L-T Lab Air Extrusion	70	10600	1.25E-05	0.33	0.1	1E-09	65	52	30	-0.33	2.7865	0.75	English
PH13-8Mo-H1050 L-T Lab Air Forging	190	30000	7E-06	0.33	0.01	1E-09	201	180	115	-0.33	5.486	0.7	English
7010-T73651 L-T Plt Lab Air	73	10000	1.31E-05	0.33	0.1	1E-09	62	63	34	-0.33	2.5057	0.8	English
7150-T7751 L-T Lab air Plate	85	10400	1.31E-05	0.33	0.1	1E-09	62	79	30	-0.33	1.9589	0.75	English
Ti-6AL-4V L-T Lab Air	140	16000	4.9E-06	0.32	0.1	1E-09	95	130	57	-0.33	4.2051	0.7	English
7050-T7451 L-T HHA Plate	75	10400	1.34E-05	0.33	0.01	1E-09	72	65	36	-0.33	2.1351	0.75	English
TI-6AL-4V C-R LAB AIR DISC	160	16000	4.9E-06	0.31	0.01	1E-09	95	150	45	-0.33	3.1208	0.7	English
7475-T7351 L-T HHA Plate	72	10400	1.31E-05	0.33	0.1	1E-09	100	62	45	-0.33	2.5926	0.75	English
4340 L-T 160-180 UTS Plt+Frg Lab air Temp 650	150	30000	7E-06	0.33	0.01	1E-09	185	120	120	-0.333	4.3829	0.75	English
7178-T6 L-T Lab Air Sheet	89	10400	1.31E-05	0.33	0.1	1E-09	48	80	25	-0.33	2.2306	0.72	English
2024-T3 Lab Air L-T	67	10600	1.29E-05	0.33	0.1	1E-09	80	49	35	-0.33	2.475	0.75	English
2618-T851 T-L HHA PLATE	53	10600	1.24E-05	0.33	0.1	1E-09	52	42	30	-0.33	2.7	0.75	English
2024-T3511 Lab Air L-T	70	10600	1.29E-05	0.33	0.1	1E-09	55	52	25	-0.33	2.794	0.75	English
2020-T651 L-T Lab air Plate	82	10600	1.28E-05	0.33	0.1	1E-09	45	77	22.5	-0.4	2.3	0.75	English

Tabular Lookup da/dN Data - 2324-T39 lab air & HHA L-T

Materials

- ALLOY STEELS
- Aluminum
  - ALUMINUM 2000/6000 ALLOYS
    - 2014
    - 2020
    - 2024
    - 2090
    - 2091
    - 2124
    - 2219
    - 2224
    - 2324
      - 2324-T39 lab air & HHA L-T
    - 2618
  - ALUMINUM 7000/8000 ALLOYS
  - ALUMINUM CASTING ALLOYS
- STAINLESS STEELS
- TITANIUM ALLOYS

Download Tabular Lookup file

General | Plot

Res ID	R	Orientation	Condition Heat Treatment
nsM2JA11AB01D1	0.1	L-T	T39
nsM2JA11AB01E1	0.1	L-T	T39
nsM2JA11AB01A1	0.1	L-T	T39
nsM2JA11AB01C1	0.1	L-T	T39
nsM2JA11AB01B1	0.1	L-T	T39
a2dn_4664	0.33	L-T	T39
a2dn_4665	0.33	L-T	T39
a2dn_4666	0.33	L-T	T39

Tabular Lookup Parameter Data

Name:	2324-T39 lab air & HHA L-T	Units:	English
Ultimate Strength:	70	Young's Modulus:	10600
Coefficent of Thermal Expansion:	1.24E-05	Poisson's Ratio:	0.33
Upper limit on da/dN:	0.1	Lower limit on da/dN:	1E-09
Plane Stress Fracture Toughness:	78	Yield Strength:	55
Plane Strain Fracture Toughness:	39	Lower limit on R shift:	-0.33

Tabular Lookup da/dN Data - 2091-T8 T-L HHA PLT&SHT

Materials

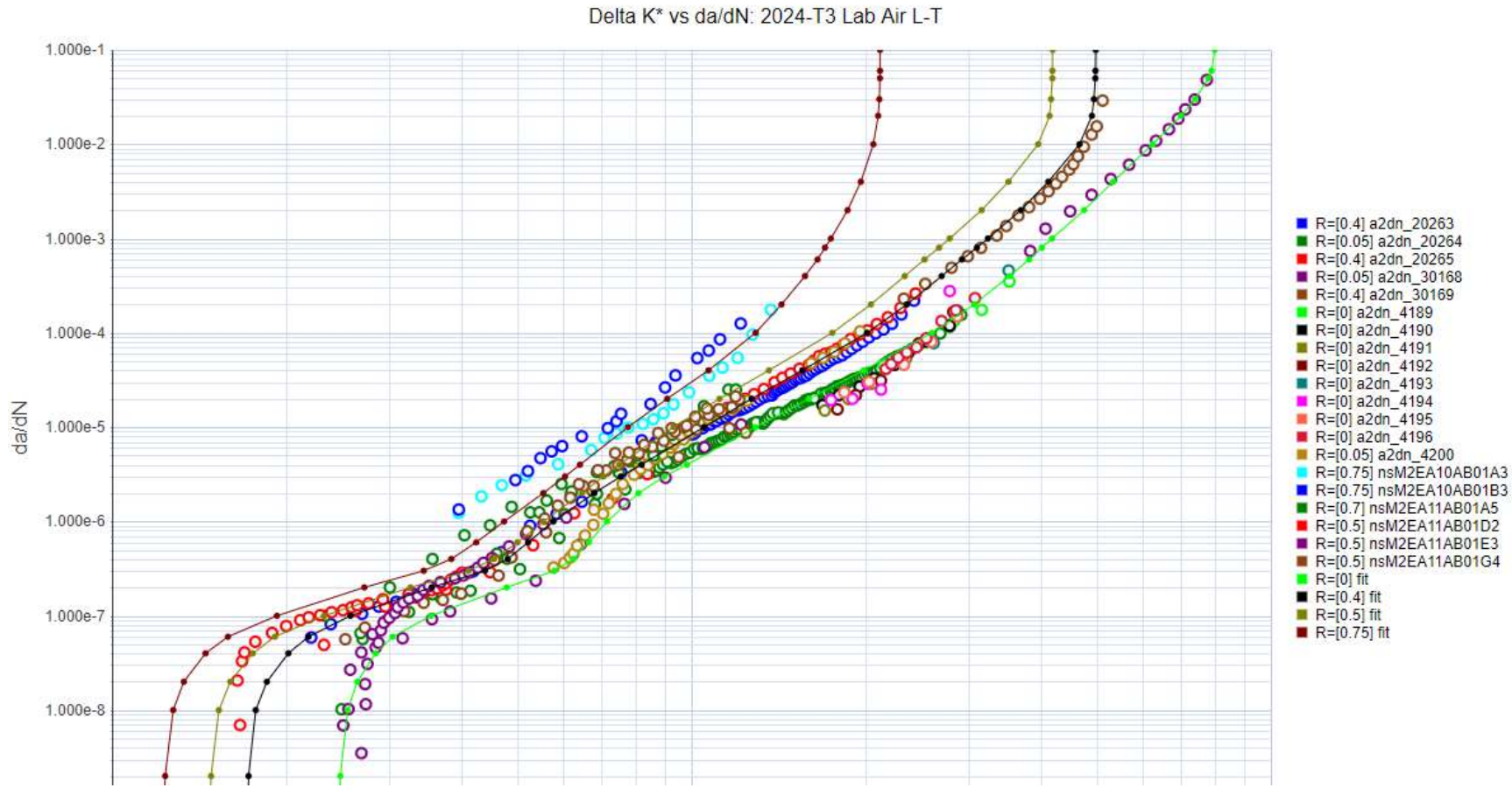
- ALLOY STEELS
- Aluminum
  - ALUMINUM 2000/6000 ALLOYS
    - 2014
    - 2020
    - 2024
    - 2090
    - 2091
      - 2091-T8 T-L HHA PLT&SHT
    - 2124
    - 2219
    - 2224
    - 2324
    - 2618
  - ALUMINUM 7000/8000 ALLOYS
  - ALUMINUM CASTING ALLOYS
- STAINLESS STEELS
- TITANIUM ALLOYS

a2dn_20016	0.5	T-L	T8;HT/275F/12HR

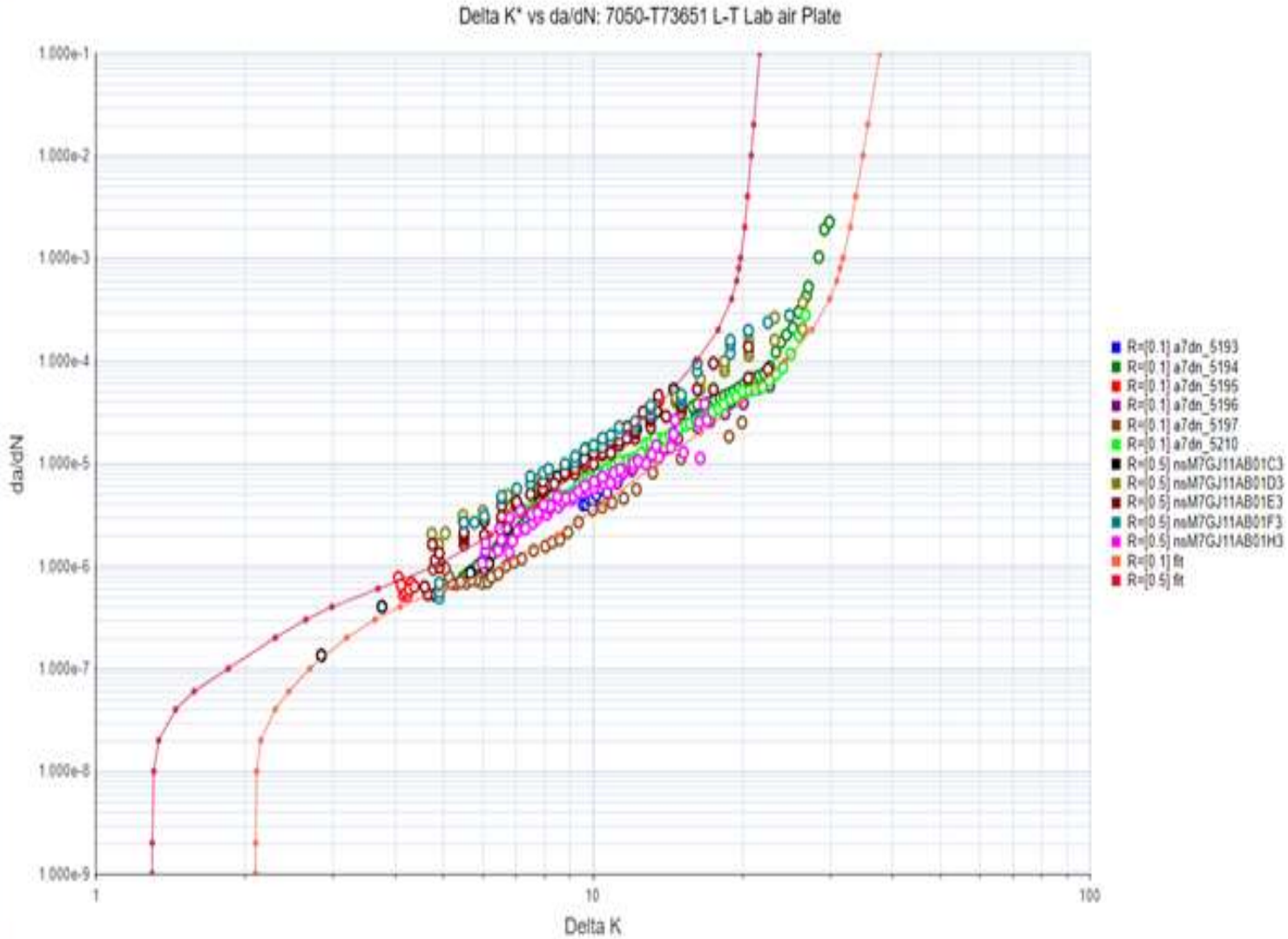
Tabular Lookup Parameter Data			
Name:	2091-T8 T-L HHA PLT&SHT	Units:	English
Ultimate Strength:	85	Young's Modulus:	10600
Coefficent of Thermal Expansion:	1.24E-05	Poisson's Ratio:	0.33
Upper limit on da/dN:	0.1	Lower limit on da/dN:	1E-09
Plane Stress Fracture Toughness:	66	Yield Strength:	75
Plane Strain Fracture Toughness:	33	Lower limit on R shift:	-0.33
Delta K threshold value:	3.55	Upper limit on R shift:	0.7

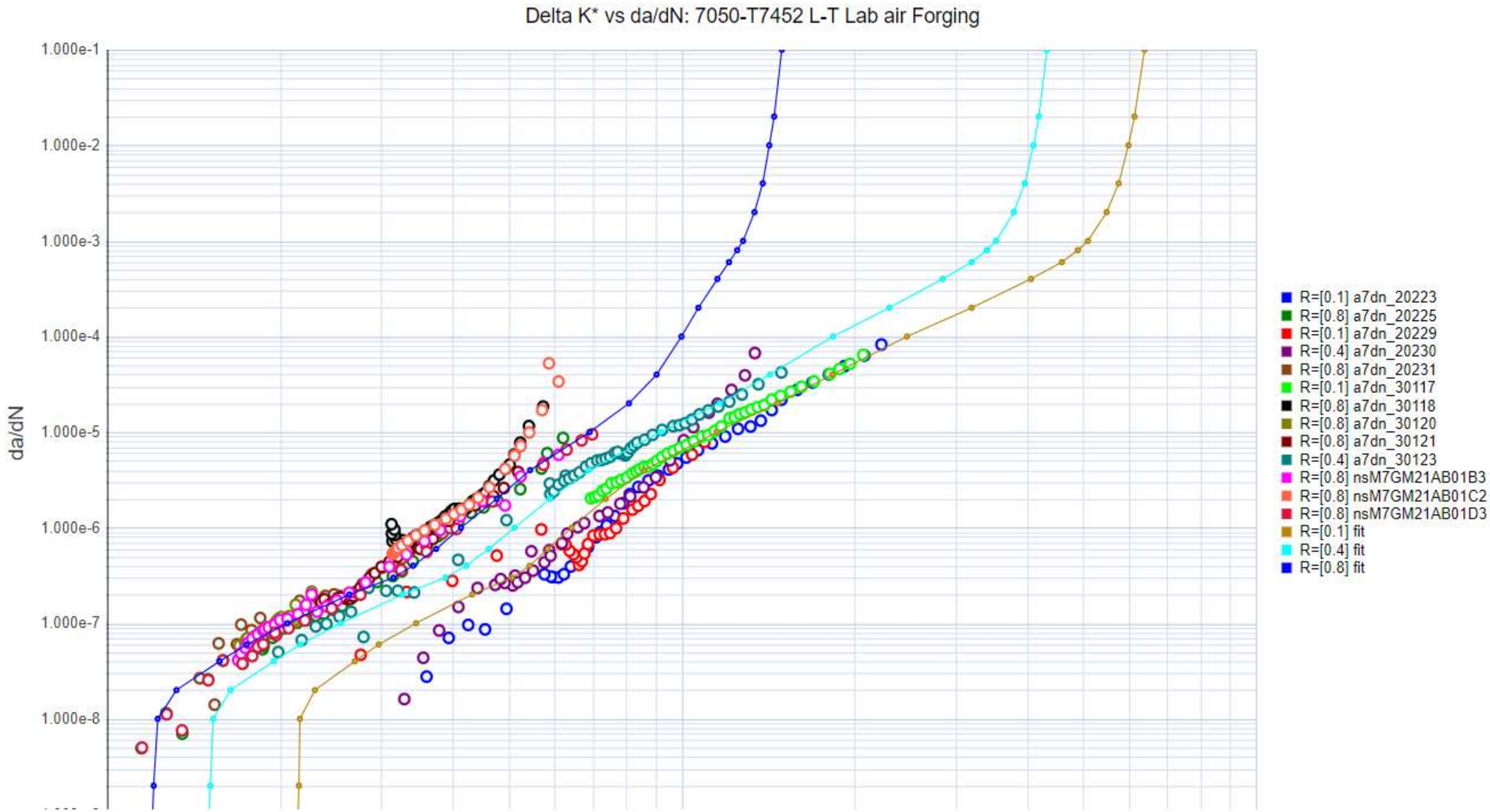
Tabular Lookup da/dN* data	R1 = 0	R2 = 0.5
1E-09	3.55	2.07
2E-09	3.551	2.075
1E-08	3.56	2.095
2E-08	3.6	2.17
4E-08	3.75	2.48
6E-08	3.98	2.8
1E-07	4.41	3.275
2E-07	5.28	4

Tabular look-up data



Tabular Lookup da/dN Data - 7050-T73651 L-T Lab air Plate




Delta K* vs da/dN: 7050-T7452 L-T Lab air Forging
da/dN
1.000e-1
1.000e-2
1.000e-3
1.000e-4
1.000e-5
1.000e-6
1.000e-7
1.000e-8
R=[0.1] a7dn_20223
R=[0.8] a7dn_20225
R=[0.1] a7dn_20229
R=[0.4] a7dn_20230
R=[0.8] a7dn_20231
R=[0.1] a7dn_30117
R=[0.8] a7dn_30118
R=[0.8] a7dn_30120
R=[0.8] a7dn_30121
R=[0.4] a7dn_30123
R=[0.8] nsM7GM21AB01B3
R=[0.8] nsM7GM21AB01C2
R=[0.8] nsM7GM21AB01D3
R=[0.1] fit
R=[0.4] fit
R=[0.8] fit