Dyes for automotive coolants - summary

Tested products:

For this purpose, 20 powder dyes and 6 liquid dye formulations listed in the table below were tested in two different coolants formulations.

Trade Names	Colour Index number	Colour index name	Trade Names	Colour Index number	Colour index name
Iragon® Blue ABL80 HFC	61585	Acid Blue 80	Iragon® Brillant Blue Liquid HFC	61585	Acid Blue 80
Iragon® Blue ABL9 HFC	42090	Acid Blue 9	Iragon® Blue ABL9-L HFC	42090	Acid Blue 9
Puricolor® Blue FBL5	42051	Food Blue 5	Iragon® Blue FBL5-L HFC	42051	Food Blue 5
Iragon® Blue DBL86 HFC	74180	Direct Blue 86	Iragon® Bright Yellow Liquid HFC	18965	Acid Yellow 17
Iragon® Green AGR25 HFC	61570	Acid Green 25	Iragon® Orange AOR7-L HFC	15510	Acid Orange 7
Puricolor® Green SGR7 FDA	59040	Solvent Green7	Iragon® Bright Pink Liquid HFC	45100	Acid Red 52
Iragon® Green AGR1 HFC	10020	Acid Green 1			
Iragon® Yellow FYE13 HFC	47005	Food Yellow 13			
Puricolor® Yellow AYE17	18965	Acid Yellow 17			
Iragon® Yellow AYE23 HFC	19140	Acid Yellow 23			
Iragon® Yellow AYE73 HFC	45350	Acid Yellow 73			
Puricolor® Yellow FYE3 FDA	15985	Food Yellow 3			
Iragon® Orange AOR7 HFC	15510	Acid Orange 7			
Puricolor® Red FRE1 FDA	14700	Food Red 1			
Iragon® Red ARE18 HFC	16255	Acid Red 18			
Puricolor® Red FRE14	45430	Food Red14			
Iragon® Red ARE27 HFC	16185	Acid Red 27			
Puricolor® Red ARE52	45100	Acid Red 52			
Iragon® Violet AVI54 HFC	42571	Acid Violet 54			
Iragon® Violet AVI48 HFC	-	Acid Violet 48			

Please note, that following dyes have strong fluorescent color effects:
Puricolor Green SGR7 FDA, Iragon Yellow AYE73 HFC, Puricolor Red ARE52 and Iragon Bright Pink Liquid HFC.

General information

Tested dye concentration:

0,005% of all powder dyes
0,01% of all liquid dye formulations

The dyes and concentrations mentioned above were added to two different coolant formulations and tested as the followed test procedure.

Test procedure:

After mixing all samples were filled into small glass bottles, sealed and tested as follows:

1. After 3 month @ dark
2. After 3 month @ day light behind window
3. After 3 month @ 45°C in oven
4. After 3 month @ 45°C in oven + 1 month @ 90°C in oven

Evaluation:

The samples were assessed visually, in particular color changes.
If precipitations were observed, this was noted separately and assessed as very bad.

++	very good	no different visible
+	good	minor changes visible
o	acceptable	changes visible
-	bad	strong changes visible
- -	very bad	very strong changes visible

Results:

- First recommendations are all dyes which were evaluated in the stability with "**excellent**"
- All tested dyes are stable, if only stored in the dark @room temperature
- Some dyes show color changes after storage @daylight behind windows.
  These results are only relevant if transparent sales packaging is used.
- No changes were observed for all dyes after 3 month storage @45°C
- After additional temperature exposure at 90°C, some dyes show significant color changes.
  This is only relevant if no color changes are required during use.
- Only Iragon Green AGR1 HFC can not recommended, cause of precipitations (storage @90°C).
- These results should help as an indication. The results may differ in other formulations or test methods.

Summary with Coolant 1 and Coolant 2:

Trade Names	(No.)	Colour Index number	Colour index name	stability in Coolant 1+2	3 month dark	3 month @day light (behind window)	3 month @45°C	3 month @45°C + 1 month @90°C	restrictions / remarks
Iragon® Blue ABL80 HFC	1	61585	Acid Blue 80	acceptable	++	+	++	-	color change to violet @90°C (C. 2)
Iragon® Blue ABL9 HFC	2	42090	Acid Blue 9	acceptable	++	+	++	-	color change to violet @90°C
Puricolor® Blue FBL5	3	42051	Food Blue 5	good	++	++	++	o	darker @90°C
Iragon® Blue DBL86 HFC	4	74180	Direct Blue 86	excellent	++	++	++	+	no
Iragon® Green AGR25 HFC	5	61570	Acid Green 25	good	++	++	++	o	sl darker @90°C (C. 1)
Puricolor® Green SGR7 FDA	6	59040	Solvent Green7	good	++	+	++	+	darker and less chromatic @daylight (C. 2)
Iragon® Green AGR1 HFC	7	10020	Acid Green 1	bad	++	++	++	--	precipitations and color fading @90°C
Iragon® Yellow FYE13 HFC	8	47005	Food Yellow 13	good	++	++	++	o	sl darker @90°C (C. 2)
Puricolor® Yellow AYE17	9	18965	Acid Yellow 17	acceptable	++	++	++	-	lighter @90°C
Iragon® Yellow AYE23 HFC	10	19140	Acid Yellow 23	excellent	++	++	++	+	no
Iragon® Yellow AYE73 HFC	11	45350	Acid Yellow 73	good	++	o	++	+	darker and less chromatic @daylight (C. 2)
Puricolor® Yellow FYE3 FDA	12	15985	Food Yellow 3	excellent	++	++	++	+	no
Iragon® Orange AOR7 HFC	13	15510	Acid Orange 7	excellent	++	++	++	+	no
Puricolor® Red FRE1 FDA	14	14700	Food Red 1	excellent	++	++	++	+	no
Iragon® Red ARE18 HFC	15	16255	Acid Red 18	good	++	+	++	o	lighter @90°C
Puricolor® Red FRE14	16	45430	Food Red14	acceptable	++	-	++	+	color fading @daylight (C. 2)
Iragon® Red ARE27 HFC	17	16185	Acid Red 27	acceptable	++	++	++	-	color fading @90°C (C. 1)
Puricolor® Red ARE52	18	45100	Acid Red 52	excellent	++	++	++	+	no
Iragon® Violet AVI54 HFC	19	42571	Acid Violet 54	excellent	++	++	++	+	no
Iragon® Violet AVI48 HFC	20	CAS 12220-51-8	Acid Violet 48	excellent	++	++	++	+	no
Iragon® Brillant Blue Liquid HFC	21	61585	Acid Blue 80	excellent	++	++	++	+	no
Iragon® Blue ABL9-L HFC	22	42090	Acid Blue 9	acceptable	++	+	++	-	color change to violet @90°C
Iragon® Blue FBL5-L HFC	23	42051	Food Blue 5	good	++	++	++	o	darker @90°C (C. 1)
Iragon® Bright Yellow Liquid HFC	24	18965	Acid Yellow 17	acceptable	++	++	++	-	color fading @90°C (C. 1)
Iragon® Orange AOR7-L HFC	25	15510	Acid Orange 7	excellent	++	++	++	+	no
Iragon® Bright Pink Liquid HFC	26	45100	Acid Red 52	excellent	++	++	++	+	no

++ = without any changes, + = slight changes, o = changes, - = strong changes