

### Corrosion of Electroless Nickel Coatings

Environment	Temperature, ° C	Corrosion Rate, $\mu$		
		m/y	LP	MP
<b>Acetic acid</b>				
5%	22		20	19
10%	22			14
50%	22			27
99%	22		severe	0.8
<b>Acetone</b>	22		0.08	nil
<b>Acrylonitrile</b>	66		0.4	
<b>Allyl chloride</b>	22		1	
<b>Aluminum sulfate, 27%</b>	22		severe	5
<b>Ammonium</b>				
bicarbonate, 15%	22			11
bifluoride, 25%	22			17
chloride, 27%	22		6	8
hydroxide, 28%	22		severe	8
nitrate, 50%	22			11
nitrate, 63%	22		severe	
phosphate, 5%	22		severe	
phosphate, 38%	22			5
sulfate, 43%	22		severe	4
<b>Amyl alcohol</b>	22		nil	
<b>Apple juice</b>	22			1.2
<b>Beef stew</b>	2			0.6
<b>Beer</b>	2		6	0.2
<b>Benzol</b>	22		0.04	
<b>Benzotrichloride</b>	40	2.5	67	6
<b>Benzoyl chloride</b>	40	1	0.8	0.5
<b>Boric acid, 1%</b>	22		severe	9
<b>Brine, 2% Cl<sup>-</sup>, 1,000 psi CO<sub>2</sub></b>	200			2
<b>Brine, 2% Cl<sup>-</sup>, 200 psi CO<sub>2</sub> + 10 psi H<sub>2</sub>S</b>	260			106

<b>Calcium</b>				
<b>chloride, 40%</b>	<b>22</b>			<b>0.1</b>
<b>nitrate, 50%</b>	<b>22</b>			<b>0.2</b>
<b>phosphate, 1.8%</b>	<b>22</b>			<b>12</b>
<b>sulfate, 2%</b>	<b>22</b>			<b>0.4</b>
<b>Caprolactam monomer</b>	<b>85</b>		<b>0.5</b>	
<b>Carbolic acid, 99%</b>	<b>95</b>			<b>nil</b>
<b>Carbon tetrachloride</b>	<b>22</b>		<b>nil</b>	<b>nil</b>
<b>Cetyl alcohol, molten</b>	<b>71</b>		<b>nil</b>	
<b>Chicken broth</b>	<b>95</b>			<b>1</b>
<b>Chromic acid, 62%</b>	<b>22</b>		<b>severe</b>	<b>35</b>
<b>Citric acid, 50%</b>	<b>22</b>			<b>7</b>
<b>Cobalt linoleate</b>	<b>22</b>		<b>nil</b>	
<b>Coca Cola</b>	<b>2</b>			<b>1.2</b>
<b>Coffee</b>	<b>95</b>			<b>6</b>
<b>Copper</b>				
<b>chloride, 5%</b>	<b>22</b>			<b>120</b>
<b>nitrate, 5%</b>	<b>22</b>			<b>12</b>
<b>sulfate, 5%</b>	<b>22</b>			<b>10</b>
<b>Corn syrup</b>	<b>22</b>			<b>0.7</b>
<b>Cresol, 10%</b>	<b>22</b>			<b>2</b>
<b>Detergent, liquid, 0.8%</b>	<b>22</b>			<b>4</b>
<b>Dibutyl phthalate</b>	<b>22</b>		<b>nil</b>	
<b>Ethanol</b>	<b>22</b>		<b>0.2</b>	<b>0.03</b>
<b>Ethylene glycol</b>	<b>22</b>		<b>0.6</b>	<b>0.03</b>
<b>Ferric chloride, 10%</b>	<b>22</b>			<b>780</b>
<b>Fluoroboric acid, 48%</b>	<b>22</b>			<b>33</b>
<b>Fluorophosphoric acid</b>	<b>22</b>		<b>severe</b>	
<b>Formaldehyde, 37%</b>	<b>22</b>			<b>5</b>
<b>Formic acid, 88%</b>	<b>22</b>			<b>13</b>
<b>Grapefruit juice</b>	<b>60</b>			<b>nil</b>
<b>Honey</b>	<b>22</b>			<b>nil</b>

<b>Hydrochloric acid</b>				
<b>1% pH</b>	<b>22</b>		<b>32</b>	<b>21</b>
<b>5%</b>	<b>22</b>			<b>25</b>
<b>18%</b>	<b>22</b>			<b>25</b>
<b>37%</b>	<b>22</b>			<b>49</b>
<b>Hydrofluoric acid, 10%</b>	<b>22</b>			<b>32</b>
<b>Hydroxyacetic acid, 100%</b>	<b>22</b>		<b>48</b>	
<b>Isoamyl octyl orthophosphate, 75%</b>	<b>22</b>		<b>nil</b>	
<b>Lactic acid</b>				
<b>80%</b>	<b>22</b>		<b>1.3</b>	
<b>85%</b>	<b>22</b>			<b>0.6</b>
<b>Lead acetate, 36%</b>	<b>22</b>			<b>6</b>
<b>Lemon juice</b>	<b>22</b>		<b>6</b>	<b>2</b>
<b>Magnesium chloride, 25%</b>	<b>22</b>			<b>2.5</b>
<b>Malic acid, 50%</b>	<b>22</b>			<b>3</b>
<b>Methanol</b>	<b>22</b>		<b>nil</b>	<b>0.05</b>
<b>Milk</b>	<b>60</b>			<b>1</b>
<b>Molasses</b>	<b>22</b>			<b>0.2</b>
<b>Naphtha</b>	<b>22</b>		<b>nil</b>	<b>nil</b>
<b>Nickel chloride, 72%</b>	<b>22</b>			<b>1</b>
<b>Nitric acid, 1%</b>	<b>22</b>			<b>26</b>
<b>Nitric acid, 20%</b>	<b>22</b>			<b>2,000</b>
<b>Oleic acid</b>	<b>22</b>		<b>0.3</b>	<b>11</b>
<b>Olives, canned</b>	<b>22</b>			<b>0.3</b>
<b>Orthochlorobenzyl chloride</b>	<b>40</b>	<b>5</b>	<b>14</b>	<b>9</b>
<b>Oxalic acid, 10%</b>	<b>22</b>			<b>11</b>
<b>Peaches, canned</b>	<b>22</b>			<b>0.2</b>
<b>Peas, canned</b>	<b>22</b>			<b>0.2</b>
<b>Petroleum, sour crude</b>	<b>22</b>		<b>nil</b>	
<b>Phosphoric acid</b>				

<b>10%</b>	<b>22</b>			<b>20</b>
<b>50%</b>	<b>22</b>			<b>13</b>
<b>75%</b>	<b>40</b>	<b>900</b>	<b>190</b>	<b>19</b>
<b>85%</b>	<b>22</b>			<b>2</b>
<b>85%</b>	<b>60</b>		<b>severe</b>	
<b>Phosphorus oxychloride</b>	<b>40</b>	<b>28</b>	<b>1.5</b>	<b>2.5</b>
<b>Picric acid, 1.4%</b>	<b>22</b>			<b>14</b>
<b>Potassium</b>				
<b>chloride, 25%</b>	<b>22</b>			<b>0.02</b>
<b>ferricyanide, 25%</b>	<b>22</b>			<b>2</b>
<b>fluoride, 48%</b>	<b>22</b>			<b>2</b>
<b>hydroxide, 50%</b>	<b>22</b>			<b>0.01</b>
<b>nitrate, 24%</b>	<b>22</b>			<b>0.6</b>
<b>Potatoes, canned</b>	<b>22</b>			<b>1.9</b>
<b>Sauerkraut</b>	<b>22</b>			<b>4</b>
<b>Sea water, synthetic, aerated</b>	<b>22</b>			<b>1.5</b>
<b>Sodium</b>				
<b>carbonate, 10%</b>	<b>22</b>		<b>nil</b>	
<b>carbonate, 18%</b>	<b>22</b>			<b>0.6</b>
<b>cyanide, 10%</b>	<b>22</b>			<b>12</b>
<b>hydroxide, 45% + 5% NaCl</b>	<b>140</b>	<b>5.3</b>	<b>12</b>	<b>failed</b>
<b>hydroxide, 35%</b>	<b>93</b>	<b>5</b>	<b>18</b>	<b>13</b>
<b>Sodium</b>				
<b>hydroxide, 50%</b>	<b>93</b>	<b>6</b>	<b>5</b>	<b>9</b>
<b>hydroxide, 73%</b>	<b>120</b>	<b>2.3</b>	<b>7.4</b>	<b>failed</b>
<b>hypochlorite, 10%</b>	<b>22</b>			<b>0.4</b>
<b>phosphate, 46%</b>	<b>22</b>			<b>4</b>
<b>sulfate, 31%</b>	<b>22</b>			<b>0.5</b>
<b>sulfide, 14%</b>	<b>22</b>			<b>nil</b>
<b>Spaghetti sauce</b>	<b>95</b>			<b>8</b>
<b>Stearic acid, 2½%</b>	<b>22</b>			<b>0.4</b>
<b>Stearic acid</b>	<b>70</b>		<b>0.5</b>	

<b>Sulfuric acid</b>				
<b>1%</b>	<b>22</b>		<b>28</b>	<b>19</b>
<b>9%</b>	<b>22</b>			<b>25</b>
<b>38%</b>	<b>22</b>			<b>20</b>
<b>72%</b>	<b>22</b>			<b>15</b>
<b>98%</b>	<b>22</b>			<b>76</b>
<b>Tall oil, refined</b>	<b>22</b>		<b>0.4</b>	
<b>Tannic acid, 50%</b>	<b>22</b>			<b>0.9</b>
<b>Thionyl chloride</b>	<b>40</b>	<b>900</b>	<b>1.8</b>	<b>2.5</b>
<b>Tomato soup</b>	<b>22</b>			<b>6</b>
<b>Urea, 25%</b>	<b>22</b>		<b>1.1</b>	
<b>Urea, 54%</b>	<b>22</b>			<b>1</b>
<b>Vinegar</b>	<b>22</b>			<b>14</b>
<b>Water, 10 ppm Cl<sub>2</sub></b>	<b>22</b>		<b>0.3</b>	
<b>Water, deionized</b>	<b>95</b>		<b>nil</b>	<b>nil</b>
<b>Water, tap, 8.6 pH</b>	<b>95</b>			<b>1.8</b>
<b>Whiskey, Scotch</b>	<b>22</b>			<b>1.8</b>
<b>Wine, Sherry</b>	<b>22</b>		<b>10</b>	<b>8</b>
<b>Zinc chloride, 81%</b>	<b>22</b>			<b>9</b>
<b>Zinc sulfate, 50%</b>	<b>22</b>			<b>3</b>

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Revised: Feb 1999.