



ISO/TC 197
Hydrogen technologies

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ISO/TR 15916 Keller - Materials compatibility comments

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Background: Please find attached the slides related to the discussion on the ISO/TR 15916 materials compatibility table and document review plan.

Committee URL: <https://isotc.iso.org/livelink/livelink/open/tc197>

ISO/TR15916 Basic Safety Considerations

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ISO/TC 197 Plenary

CEA Grenoble, France

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Table 1 — Hydrogen embrittlement susceptibility of some commonly used metals (data from ISO 11114-4)

Metal	Extremely embrittled	Severely embrittled	Slightly embrittled	Negligibly embrittled
Aluminium alloys				
1100				X
6061-T6				X
7075-T73				X
Be-Cu alloy 25				X
Copper, OFHC				X
Nickel 270		X		
Steel				
Alloy steel, 4140		X		
Carbon steel				
1020			X	
1042 (normalized)			X	
1042 (quenched & tempered)		X		
Maraging steel, 18Ni-250	X			
Stainless steel				
A286				X
17-7PH	X			
304 ELC		X		
305		X		
310			X	
316			X	
410		X		
440C		X		
Inconel 718	X			
Titanium and titanium alloys				
Titanium			X	
Ti-5Al-2.5Sn (ELI)		X		
Ti-6Al-4V (annealed)		X		
Ti-6Al-4V (STA)		X		

Comment [Office1]: This data, I believe, comes from notched tensile data, which is not representative of behavior in service.

Comment [Office2]: Commonly used in transportable gas cylinders for hydrogen. For lift tanks are made from similar material.

Comment [Office3]: A-286 is embrittled in fracture. Probably more than 304L.

Comment [Office4]: Generally very susceptible to hydrogen.

Comment [Office5]: I don't know to what 'ELC' refers. Extra low carbon? Not a common used grade. 304L is a more common grade. I would not generally classify as severely embrittled, but it depends on your metric of evaluation. Generally, strongly hydrogen embrittled 304L retains ductility that is superior to aluminium in air.

Comment [Office6]: I would add 316L, perhaps 316/316L

Comment [Office7]: Severely embrittled.

Comment [Office8]: I would not use this material in H2., e.g., Emeryville failure. But always depends on application.

Comment [Office9]: Depends on heat treatment condition.

Comment [Office10]: Titanium alloys that contain alpha-phase (such as Ti-6Al-4V) turn powder when stressed in hydrogen. These should not be used in hydrogen.

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