

DUAL ALLOY SOLDERING

The PCB assembly industry continues to investigate better soldering technology and alternative LEAN manufacturing processes that could reduce cost.

Alpha, the leading soldering material supplier, has introduced an innovative lead-free low temperature SnBiAg alloy solder paste. This product receives tremendous response from the market. However, current manufacturing techniques limit the availability of a SnBiAg cored wire to support touch-up or rework. Typically, users prefer to use the same alloy in their soldering process although they understand that applying two different alloys within a solder joint is feasible. But, the interest is its reliability and the impact on its mechanical strength.

To address this concern, the following joint reliability study has been conducted to evaluate the use of a dual alloy system in the SMT and SMT rework process. Specimens were prepared with joints soldered (400°C tip temperature) with both the same and different alloys as per the following configurations shown in the table. The study includes

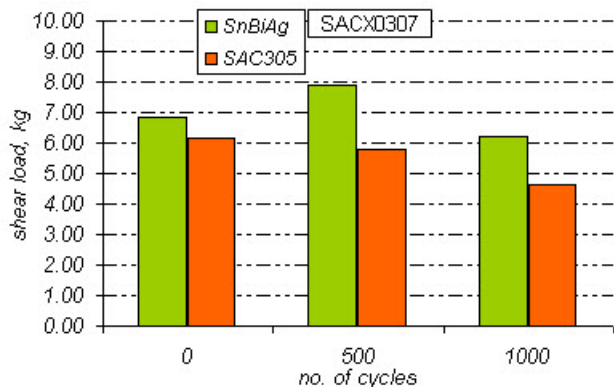
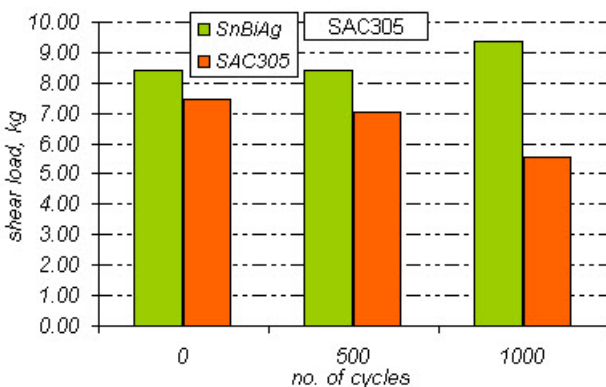
- Thermal Cycle Test (-40°C to +125°C)
- Cross-Section Analysis
- Inter Metallic Compound (IMC) Thickness
- Shear Testing

Solder Paste	Cored Wire	0 Cycles		500 Cycles		1000 Cycles	
		IMC μm	Shear Load kg	IMC μm	Shear Load kg	IMC μm	Shear Load kg
SnBiAg	SAC305	0.90	8.43	2.19	8.40	1.84	9.37
	SACX0307	1.48	6.83	1.74	7.88	2.15	6.20
SAC305	SAC305	1.03	7.48	3.18	7.02	3.06	5.58
	SACX0307	2.02	6.16	1.88	5.78	2.56	4.61

Table - 1

Cross-sectional analysis was conducted on the hand soldered components of the board. The Stereo, Optical and SEM images of the boards subjected from 0 to 1000 thermal cycles are shown in Fig.1 to 3. A stringent thermal cycle test was carried out with temperature from -40°C to +125°C instead of the standard 0°C to 100°C for typical consumer electronics products. The inspections of the joints show continuous IMC up to 1000 cycles with no defect such as non-wetting or cracks.

From the Shear Load result, it shows a consistent higher joint strength for SnBiAg alloy that is reworked with either SAC305 or SACX0307 cored wire compared to the system using SAC305 alloy with SAC 305 or SACX touch up wire.



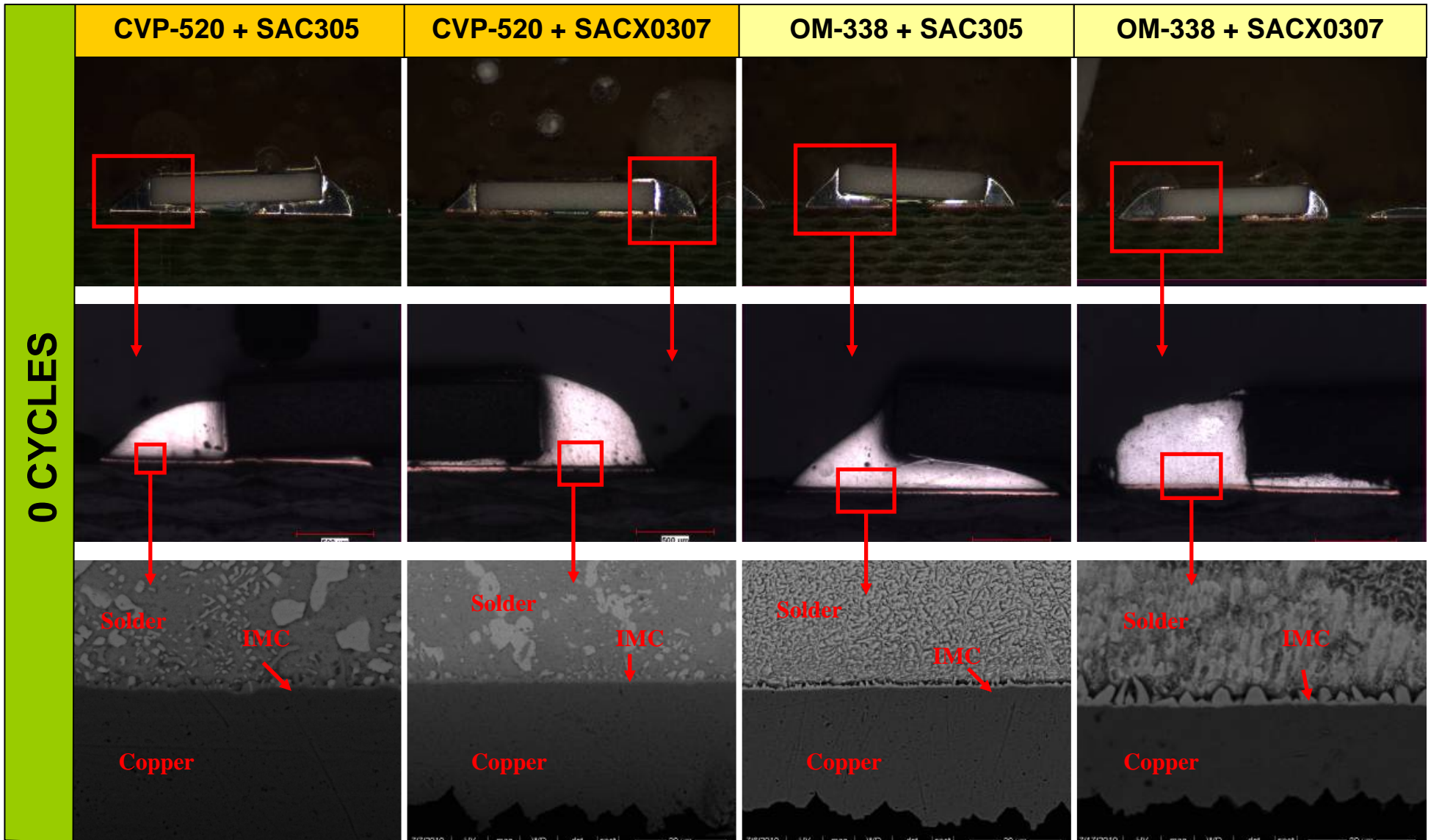


Fig.1 – Analysis at 0 thermal cycles

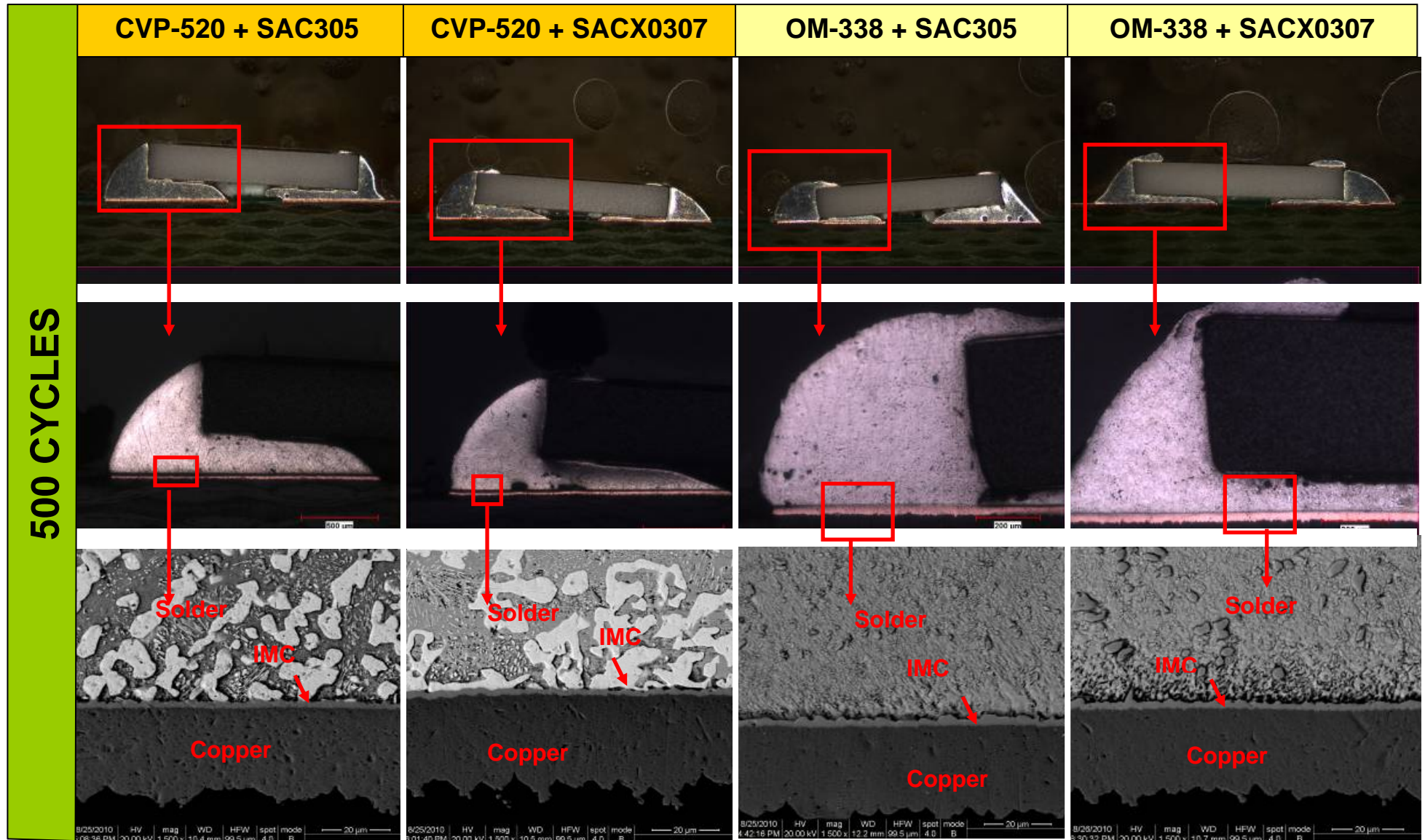


Fig.2 – Analysis at 500 thermal cycles

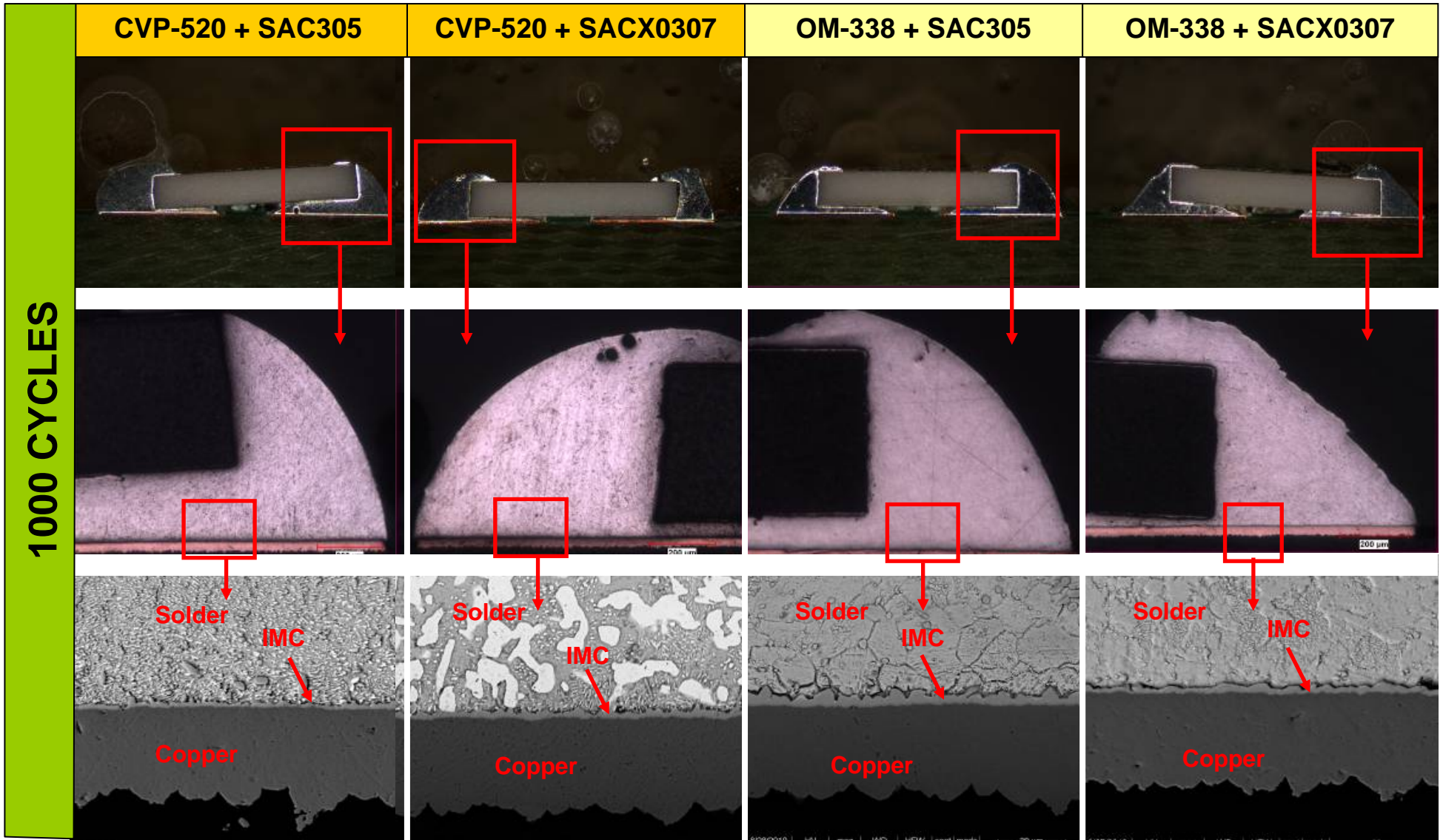


Fig.3 – Analysis at 1000 thermal cycles