

Chrome Soft Golf Balls

Dr Alan Hocknell, Senior Vice President of Research and Development at Callaway Golf discusses the new Callaway Chrome Soft and Chrome Soft X Golf Balls and a world first in golf balls – the inclusion of a revolutionary, Nobel Prize-winning material stronger than diamond and 200 times stronger than steel...

What is special about the 2018 Chrome Soft and Chrome Soft X Golf Balls?

The new balls feature a new and revolutionary graphene-infused Dual SoftFast™ Core. Both golf balls combine Tour-proven performance with unparalleled feel and are extremely fast, yet soft feeling, to promote high launch and low spin off the tee for long distance, and shot-stopping spin into and around the green.

What is graphene?

Graphene is an atomic-scale honeycomb lattice made of carbon atoms and was first produced in a laboratory at the University of Manchester in 2004 by Russian-born scientists, Andre Geim and Konstantin Novoselov, who went on to be awarded the 2010 Nobel Prize in Physics for their work.

Graphene is super-strong – stronger than diamond, 200 times stronger than steel and believed to be the strongest material in the world.

Remarkably, it's both stiff and elastic so you can stretch it by an amazing amount - 20-25% of its original length - without it breaking, because the flat planes of carbon atoms can flex relatively easily without the atoms breaking apart.

How did you come to use it?

Our golf ball R&D team keep their eyes and ears open for material opportunities all the time. One of our polymer chemists had read a number of papers on graphene and opened a dialogue with a small number of suppliers who are able to deal with it, and we quickly built a picture of how it might be used in a golf ball.

A lot of the time graphene is not used in its native form – a nano-scale powder – but as an additive that is mixed with other materials.

How did you decide how to use it?

We had to assess which part of our golf ball we could mix it with to get a strength advantage and where in the golf ball we would want it, bearing in mind that pretty much anything graphene 'looks at' turns it black! Even though it is slightly transparent, the carbon content always comes to the fore if you use enough of it. We looked at various parts of the golf ball and the functions of each, and we quickly decided that if we were going to use a material that made any part of our golf ball substantially stronger it would be in the outer core, because its role is partly to allow the inner core to be soft.

What we wanted to produce was an outer core that was much stronger, effectively a thinner but stronger 'crash helmet' for the inner core and that would allow us to make the inner core bigger.

If you think of this inner core as the engine of the golf ball, the inner of the new Chrome Soft is now bigger and softer because it is protected by the stronger outer core, which allows us to pump up the speed, pump up the spin-reducing characteristic of the soft core, and still retain the soft-feel benefits.

The outer core is a firmer blend of polybutadiene rubber compared to the inner core and it is made much stronger as the nano-particles of graphene get in-between the long polymer chains and make them significantly stronger.

What does it mean to the golfer?

Those who are familiar with Chrome Soft will see that we have retained the overall soft feel of the golf ball, although we intentionally have changed the feel when playing shots near the green to make it have a crisper 'clickier' sound. This has been achieved after direct feedback from customers who said they would benefit from greater audio response around the green.

People should also notice higher ball speeds from the driver with both balls, and significantly better distance with mid-irons and approach shots.

Off the driver there is a reduction in spin, relative to the original Chrome Soft, and an increase in speed, without giving up any launch angle – and that's a recipe for greater overall distance. All these playing features will be noticeable, particularly to the more astute players.

How do you differentiate Chrome Soft and Chrome Soft X?

The X ball has undergone the bigger transformation of the two. The original Chrome Soft X was intended and designed to have a spin profile similar to some key competitor products.

It was meant to be a ball to allow golfers to transition into a Callaway product and some of the benefits of our soft core technology but, in truth, it wasn't differentiated enough to give people a reason to switch.

In the new 2018 Chrome Soft X we have dramatically reduced its spin profile through the bag so, in many ways, it is similar to the standard Chrome Soft ball of 2017, but what you will find now is a firmer overall feel, while still retaining excellent spin properties around the green.

The differences between both golf balls are mostly focused on feel and then if you have a swing speed in the higher ranges - roughly 105mph and above - you might be an ideal candidate for the X, as its increased firmness will convert more driver head speed to ball speed, compared to standard Chrome Soft.

Can you be 'fitted' for a Chrome Soft?

If there was a fitting axiom from us, you should play the softest compression golf ball you feel comfortable with for all aspects of your game because softer golf balls are more forgiving and that is something experts haven't really talked about before.

When you don't hit the centre of the face, the softer balls still compress and therefore still convert head speed to ball speed more efficiently than harder golf balls. We have lots of data to prove this.

Chrome Soft Golf Balls with ‘added forgiveness’ then?

We want to start to educate people about the forgiveness of their golf ball. Golfers are used to driver and iron forgiveness, but golf ball forgiveness is a very big deal, which hasn't been reported extensively.

Lower compression balls like Chrome Soft have a real advantage. It's why people out on the course, who have no idea of the physics of the golf ball, see a shot creep over the lip of a bunker and get on the green when they know they didn't quite hit it well enough.

It is the forgiveness factor of the golf ball that they are witnessing, maintaining speed when you don't hit the centre of the face.

Have the covers on the new Chrome Soft Golf Balls changed?

Both Chrome Soft 2018 Golf Balls have softer urethane covers and that is helping the product generate enhanced greenside spin. The softer cover also highlights another reason to have graphene in the outer core.

The urethane cover reacts more positively to the graphene-enhanced harder outer core, generating and controlling consistent spin performance. This outer core effectively ‘grips’ to the outer cover when the ball is compressed against the club face, helping to generate consistently high levels of spin.

Why don't you have a single-core golf ball with graphene in just one inner core?

If you compare Chrome Soft and its dual-core construction to other single core, low compression golf balls on the market, you find that the single core ball has one very significant performance downside - it does not perform like a Tour ball near the green.

This is partly down to the fact that a single core ball does not possess a hard layer for the soft urethane cover to react against when hitting wedge shots, and that is the significant advantage of Chrome Soft and Chrome Soft X, both are true all-rounders, with Tour levels of performance.

With the cover being softer, is it still durable?

The great thing about urethane is that it becomes more durable the softer it gets - the opposite to Surlyn, the cover material primarily used in less expensive golf balls. Effectively, the new Chrome Soft is actually more durable and spins more in and around the green than the 2017 product because of the softer cover. It's a win-win!

Will we see graphene in other Callaway products?

There is actually graphene in the carbon fibre of the Synergy shaft in the Rogue Driver! Shaft manufacturer, Aldila, incorporated it in the development and it forms a role in the resin material of the carbon fibre, in a similar fashion to how it works in our golf ball.

The idea of us putting graphene into other carbon fibre parts is an interesting one. A long time ago we had an all-carbon driver called C4 which had a carbon body and face and was way ahead of its time.

The limitations we had on the carbon materials we were using back then meant that any advantage we found in using materials with a lighter weight, were undone by the amount of carbon fibre that was needed to make the face of the club durable, and when you had to do that, you didn't get high COR.

But as the world moves on, graphene might open the door to re-visit some carbon applications.

However, incorporating graphene into things that we have to melt in order to get the shapes we want, i.e. titanium or steel, are perhaps not for us just yet.

Can other manufacturers use graphene?

We are in the process of exploring graphene patents in our golf balls, and in specific areas where we think it has a performance advantage. So this is work in progress.