

Aluminium-steel fusion welding: What happens at the interface?

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Hello, my name is Peter Brommer. Hi, I am Prakash Srirangam. And today we would like to talk about our project

This is a technologically really important problem because we often are in the situation that we want to join together two different metals, for example Aluminium and Steel. Yeah, in case of similar materials as we know like any particular material like Aluminium-Aluminium, this is what we see at the weld interface, where it is easy to join these two similar materials. But when it comes to the joining of different materials, for example in this case Steel to Aluminium, what we can see is this is the weld interface.

So, macroscopically this looks okay, but what happens is when we want to use this dissimilar welded joint like Steel to Aluminium for the applications, the weld interface gets become brittle because of the intermetallics formation. Okay, and in this project, we want to look at that mainly in a computer model. So, I have created a cartoon here with two different materials where you have two different kinds of atoms at the top, the lighter atoms and the bottom, the slightly darker atoms, but they also are in a different arrangement.

And now if you want to weld them together, we could do this for example by laser welding. So, we shine a laser on there and then this heats up the material to a very high temperature and the atoms move among each other and they move into the space of the other material. (1:43) And when everything cools back down, then we have these atoms in a different arrangement.

And as Prakash said, what we get here is we get intermetallics forming. So, materials that combine the two metals in a certain specific way. And the problem with these intermetallics is that some of them can be extremely brittle.

And now what happens if we put a load on our material is it can crack and then fail at that point. And at that point, our weld joint has failed and this is usually not a good thing to happen. Yeah.

So, in addition to studying this atomistic modeling to understand the intermetallics formation, we also wanted to understand them experimentally. For example, how these intermetallics form and what is the size, distribution and crystallographic information. This can be obtained by using microscopy techniques.

And we use a scanning electron microscope as well as transmission electron microscope because of to characterize these intermetallics at different length scales. Yes and in this project, you will have the chance to combine the model together with the micrographs and see how these match up and inform one from the other.

Thank you. Thank you very much.