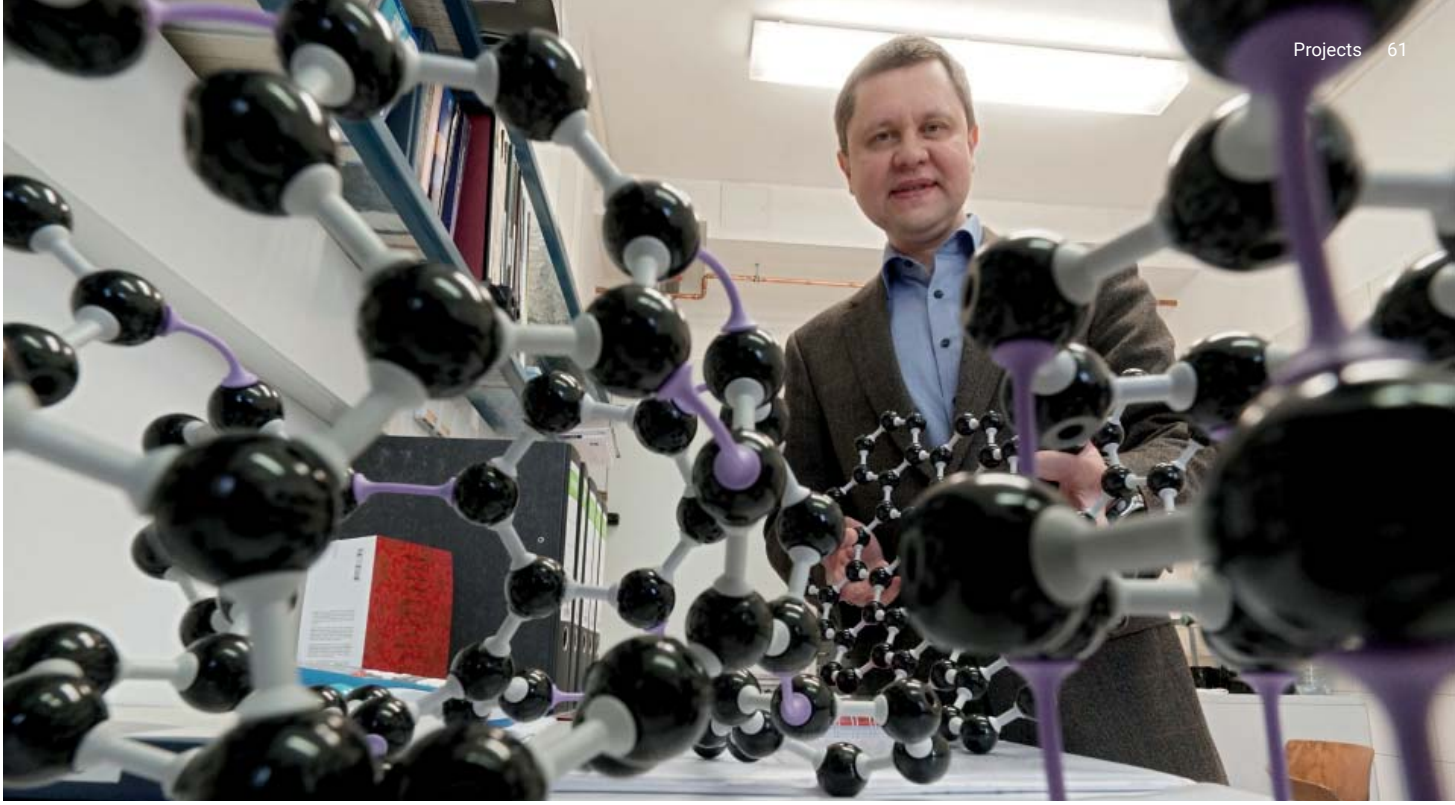

Prof. Andrey Turchanin investigates nanoscale 2D materials such as graphene.

The best of two nanoworlds

An international team of scientists coordinated by Jena professor of physical chemistry Andrey Turchanin is working on new applications in the area of flexible electronics by developing ultrathin hybrid sheets of organic semiconductors and inorganic atomically thin 2D materials. The research project is supported with 847,000 euros by the EU funding programme FLAG-ERA.

BY JULIANE DÖLITZSCH

It is every researcher's dream: an invention is followed by a patent application, a renowned scientific journal then publishes the research results, and, finally, a funding agency provides nearly a million euros in order to make the idea a reality. It is precisely what has come true for Prof. Andrey Turchanin of the Institute of Physical Chemistry.

In October 2017, the EU programme FLAG-ERA announced which proposals will be supported within the Flagship projects Graphene and Human Brain over the coming years. The only project to be selected that is coordinated from Germany was »H2O« – Heterostructures of 2D materials and organic, semiconducting nanolayers – which was funded with 847,000 euros for three years from January 2018. In this initiative, project leader Prof. Turchanin and Dr Bert Nickel from Ludwig Maximilian University in Munich are building on their invention of an ultrathin sheet made of organic semiconductor pentacene. Previously, the results of their research were published in »Advanced Materials«. In collaboration with scientists from the Netherlands and Sweden, the researchers are further developing this novel nanomaterial with a thickness of only 50 nanometres.

Assembly with atomically thin sheets

»We will use the funding to create new applications for organic semiconductor nanosheets, for which we have applied for a patent, by combining them with inorganic atomically thin 2D materials such as graphene and transition metal dichalcogenides, thus employing the best properties of these two complementary material classes,« explains Turchanin. The project will start with a thorough characterization of the properties through microscopy and spectroscopy. Using the layer-by-layer assembly of organic and inorganic nanosheets, the hybrids with the desired properties will be produced: »flexible, conductive, switchable, and environmentally friendly,« explains Turchanin. Among potential applications of these materials, he sees flexible electronic devices including displays, solar cells and sensors.

Since the discovery of insulated single-layer graphene sheets, research of graphene and related 2D materials has been one of the hottest topics in physics, chemistry and materials science. This field is considered to be so promising that since 2013 the European Union has dedicated one its two major research initiatives to developing and implementing these nanomaterials. Annual calls for proposals such as FLAG-ERA aim to attract innovative ideas to this initiative.