The space between stars in our Galaxy and other similar (spiral) ones is not empty but filled with a very rarefied matter; the density of the latter is well below that, available in laboratory vacuum. The interstellar matter (ISM) is composed of gas and dust. The latter affects continua of stars observed through ISM in the way similar to what one can observe during the sunset, i.e. red rays penetrate ISM more easily than blue ones. This phenomenon is known as „reddening". Reddened stars are seen fainter than they would be if seen through empty space. Despite reddening one observes also atomic lines, formed in the interstellar gas. These lines are formed in very specific (from our laboratory point of view) conditions, where time between subsequent collisions of an atom is as long as a couple of weeks. In such conditions all atoms occupy the lowest energy state and only lines having this state as the beginning level are observed; most of them in the satellite ultraviolet. Since late 1930-ties a few simple, two—atom molecules are also known as residents of ISM. They are: CH, CH^+ (it is formed in different than CH process) and CN. Recently the number of molecules, revealed by absorption lines in spectra of reddened stars have grown to 10, the most complex being the C_3 one. Since late 1960-ties we observe more and more complex molecules thanks to microwave emissions, originated in star forming regions, i.e. clouds much denser than typical ISM and irradiated by recently formed stars. However, the general ISM produces also the longest standing unsolved problem in all of spectroscopy. The clouds producing reddening, atomic and molecular lines, produce also so called diffuse interstellar bands (DIBs) – the spectral features which profiles are broader than those of atomic or molecular lines but which are usually very shallow. First two such features have been observed in 1922 but until now they remain unidentified. Practically all conceivable forms of matter have already been proposed as their carriers: from the hydrogen negative ion to dust grains. Currently it is commonly believed that DIB carriers are some complex molecules. It was natural to check whether they can be the same species as those, observed in star forming regions. However, the result of comparison of the laboratory spectra of the above mentioned molecules is negative for all proposed forms of molecules, i.e. carbon chain species, polycyclic aromatic hydrocarbons (PAHs) and fullerenes. All proposed identifications have been disputed and none of them can be considered as certain.

The above situation leads to the conclusion than a breakthrough requires some atypical idea. It is hard to propose anything but molecules as DIB carriers but – what are these molecules? The main constraint is the table of elemental abundances in the Universe. Usually some carbon compounds are proposed as DIB carriers because of the carbon abundance and its possibility to form very different species. On the other hand there are many carbon-bearing molecules which makes abundances of single species very low anyway. In this situation we decided to propose something „unusual" i.e. sulphides of transient metals, in particular FeS. These are simple, two-atom molecules, similar in this respect, to those, identified in the general ISM. Both iron and sulphur are reasonably abundant in the Universe but they are not involved into so many molecular species which may lead to pretty strong spectral features of FeS.

We expect thus to get laboratory spectra of FeS and similar sulphides in the well equipped laboratory of the Rzeszów University. As soon as they are obtained we want to compare them to the observed spectra. We can use the instruments of the ESO but we may expect only a few nights. Thus we got involved into the cooperation with the Ukrainian Observatory Terskol (Caucasus Mountains) and Shamakhy Observatory (Azerbaijan). They are both equipped with Zeiss 2 m telescopes and high resolution echelle spectrographs. High resolution of laboratory and observed spectra should allow the identification of DIB carriers by means of comparing directly the profiles of spectral features. It would be important to find unknown yet interstellar molecules as the general ISM clouds are raw material for star forming regions, modelled recently with the aid of microwave ALMA spectra. The collapsing clouds contain naturally DIB carriers which must influence the above mentioned models.