CASE STUDY

Furthering my knowledge via BRISK Transnational Access

Amal Al-Rahbi, of the University of Leeds, UK, discusses how BRISK Transnational Access offered her the opportunity to broaden her PhD research via ENEA's facilities in Italy

I am a PhD student at the School of Process and Chemical Engineering at the University of Leeds, UK. Biomass is a renewable energy source which can be converted via gasification to produce a syngas. However, the syngas contains high molecular weight tar which causes problems with downstream utilisation. Carbonaceous char can act as a catalyst to degrade the tar components to useable gases. A novel approach to this idea is to use chars which have been produced from the pyrolysis of waste materials. My research at the University of Leeds focuses on the development of materials to be used as a catalyst for the cracking of tar vapours during the pyrolysis-gasification of biomass.

The BRISK initiative provided me with a great opportunity to evaluate the effectiveness of char materials in cracking tar in the gas stream using a pilot scale gasifier known as PRAGA at the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA).

Applying to take part in BRISK Transnational Access was simple and it only took around three months from my first contact with BRISK for my application to be approved. After setting the research plan with my supervisor Professor Paul Williams, I found that ENEA would be the best place to test the char materials for tar reduction as they have suitable facilities and their work coincides with my research interests. It was a great opportunity for me to get a unique experience and strengthen my knowledge in this field.

During my two week visit, the efficiency of char for tar reduction was tested using updraft gasification. The

Figure 1: Updraft gasification reactor (PRAGA) at ENEA, Italy.

Figure 2: Tar sampling points.

gasification process included a gasification reactor with a height of 2.4m and a diameter of 0.5m. The temperature inside the reactor is monitored using 11 thermocouples placed in a protective steel tube. The feedstock capacity of the reactor is 20-30kg/h. Samples of the gases and liquid formed as a result of the biomass gasification were collected and examined using various analytical techniques. The gaseous

Continued on next page

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Figure 3: Analysis the tar samples with help from ENEA's team.

stream was sampled at the exit of the scrubber and analysed online using a Gas Chromatograph equipped with a Thermal Conductivity Detector (GC-TCD). The condensable matter formed during the gasification was measured offline using Gas Chromatograph-Mass Spectrometry (GC-MS), High Performance Liquid Chromatography (HPLC), and a Gas Chromatography-Flame Ionisation Detector (GC-FID). It was found that the char material had effectively reduced most of the tar compounds. In summary, char produced from almond shell carbonisation looks promising in its ability to reduce most of the heavy compounds formed during the gasification process.

Acknowledgment
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Figure 4: Amal Al-Rahbi with the ENEA team in Italy.

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