The Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids of the European Food Safety Authority was requested to evaluate 41 flavouring substances in Flavouring Group Evaluation 21, Revision 5, using the Procedure in Commission Regulation (EC) No 1565/2000. This revision was carried out because of the inclusion of the assessment of new toxicity data on the candidate substances, 5-ethylthiophene-2-carbaldehyde [FL-no: 15.074] and 2-pentylthiophene [FL-no: 15.096]. These data on 5-ethylthiophene-2-carbaldehyde [FL-no: 15.074] should cover 2-acetylthiophene [FL-no: 15.040] and 2-propionylthiophene [FL-no: 15.097]. These data on 2-pentylthiophene [FL-no: 15.096] should cover 2-butylthiophene [FL-no: 15.045], 2-hexylthiophene [FL-no: 15.076] and 2-octylthiophene [FL-no: 15.093]. For two of the substances [FL-no: 15.060 and 15.119] the Panel concluded that additional genotoxicity data are required. The remaining 39 substances were evaluated through a stepwise approach (the Procedure) that integrates information on structure–activity relationships, intake from current uses, toxicological threshold of concern and available data on metabolism and toxicity. The Panel concluded that the 39 flavouring substances [FL-no: 15.038, 15.039, 15.040, 15.044, 15.045, 15.050, 15.051, 15.052, 15.054, 15.055, 15.057, 15.058, 15.061, 15.062, 15.063, 15.067, 15.068, 15.069, 15.071, 15.074, 15.076, 15.078, 15.079, 15.080, 15.082, 15.084, 15.085, 15.086, 15.087, 15.089, 15.093, 15.096, 15.097, 15.098, 15.108, 15.115, 15.116, 15.118 and 15.135] do not give rise to safety concerns at their levels of dietary intake, estimated on the basis of the Maximized Survey-derived Daily Intake (MSDI) approach. Besides the safety assessment of these flavouring substances, the specifications for the materials of commerce have also been considered. Adequate specifications, including complete purity criteria and identity for the materials of commerce, have been provided for all 41 candidate substances.