o-N-Tosylcarbamoyl-substituted α-Diazoacetophenones: their Preparation and Decomposition

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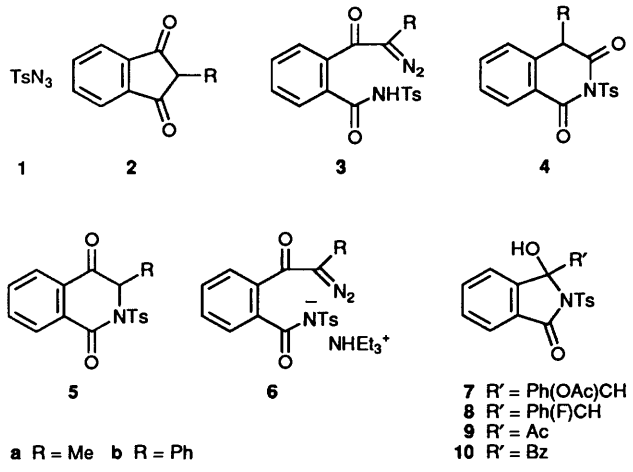
A diazo group transfer reaction of tosyl azide with 2-methyl- **2a** and 2-phenyl-indane-1,3-dione **2b** in the presence of triethylamine leads to the isolation of the corresponding *o-N*-tosylcarbamoyl-substituted α-diazoacetophenones **3a, b** as their triethylamine salts **6a, b** in fairly good yield. Upon decomposition in boiling benzene or, at room temperature, in water, acetic acid or methylene dichloride in the presence of BF_3·OEt_2, and benzene in the presence of rhodium(II) acetate the diazocarbonyl compounds **6a, b** can lead to isoquinoline-1,3-diones, isoquinoline-1,4-diones and 3-hydroxyisoindolones in varying yields. The relative ratio of these resulting products is (highly) dependent upon reaction conditions and their diazo precursor **6a** or **6b**. The possible reaction pathways involved in the diazoacetophenone **6a, b** decompositions are discussed. An X-ray crystal structure analysis of the (*S,R*; *R,S*)-diastereoisomer of the isoindolone **7** has been performed.

In earlier work we investigated the diazo group transfer reaction of toluene-*p*-sulfonyl (tosyl) azide **1** with methylene β-dicarbonyl compounds in hexamethylphosphoric triamide (HMPA). Under these mildly basic conditions and with a polar solvent (and with no other reagent present) α-diazo compounds were generally obtained in high yield.[1] This study was subsequently extended[2] to cyclic α-monosubstituted β-diones, such as 2-methyl- **2a** and 2-phenyl-indane-1,3-dione **2b**.

The azide **1** reacted with the indanedione **2a** in HMPA, at room temperature, to give a *ca.* 1:1 mixture of the isomeric 2-tosyl-substituted isoquinolinediones **4a** and **5a**, whereas with the indanedione **2b** essentially gave the isoquinoline-1,3-dione **4b**. The products **4a, b** and **5a** were ascribed to intramolecularly acid-catalysed decomposition of the expected diazoacetophenones **3a, b** which proved to be (very) unstable compounds. In fact, only the diazo compound **3b** could be isolated in low yield.

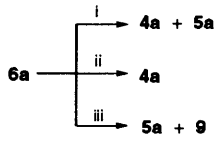
In the light of these findings we were prompted to investigate the reaction of tosyl azide **1** with the above diones **2a, b** in the presence of triethylamine, a base often employed for diazo transfer reactions to active methylene compounds.[3] We reasoned that in the presence of such a base the resulting diazo keto amides **3a, b** might conveniently be isolated as more stable triethylamine salts **6a, b**, thus allowing a study of their decomposition reactions.



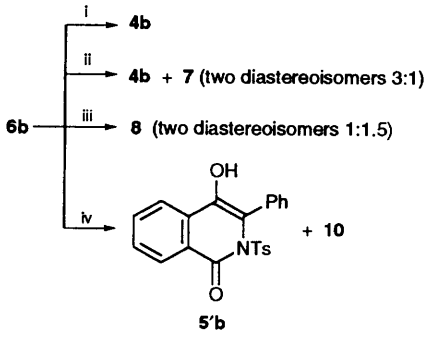
Results and Discussion

Reaction of 2-methylindanedione **2a** with 1 mol equiv. of tosyl azide **1** in diethyl ether at room temperature, in the presence of triethylamine (1 mol equiv.), led within several hours to the formation of the expected triethylamine salt **6a** which could be readily isolated as a pale-yellow solid (77%). Under similar conditions 2-phenylindanedione **2b** reacted as a solution in THF with a three-fold excess of the azide **1** to give the corresponding diazo amide salt **6b** (78%). The salts **6a, b** were quite stable in benzene solution at room temperature, but at 95 °C (in a sealed tube) they were totally decomposed over 1 h to give a 55:45 mixture of the isomeric isoquinolines **4a** and **5a** (65%) and the isoquinoline **4b** (75%) respectively (Schemes 1 and 2).

The diazo salt **6a** decomposed in aqueous solution at room temperature within 10 days, in dichloromethane in the presence of BF_3·OEt_2 within 2 h and in acetic acid within 5 min to give the isoquinolinedione **4a** as the only identifiable product in 30, 28 and 80% yield, respectively (Scheme 1).



Scheme 1 *Reagents and conditions:* i, benzene, 95 °C; ii, H_2O, 25 °C or AcOH, 25 °C or BF_3·Et_2O, CH_2Cl_2, 25 °C; iii, $Rh_2(OAc)_4$, benzene, 25 °C



Scheme 2 *Reagents and conditions:* i, benzene, 95 °C or H_2O, 25 °C; ii, AcOH, 25 °C; iii, BF_3·OEt_2, CH_2Cl_2, 25 °C; iv, $Rh_2(OAc)_4$, benzene, 25 °C

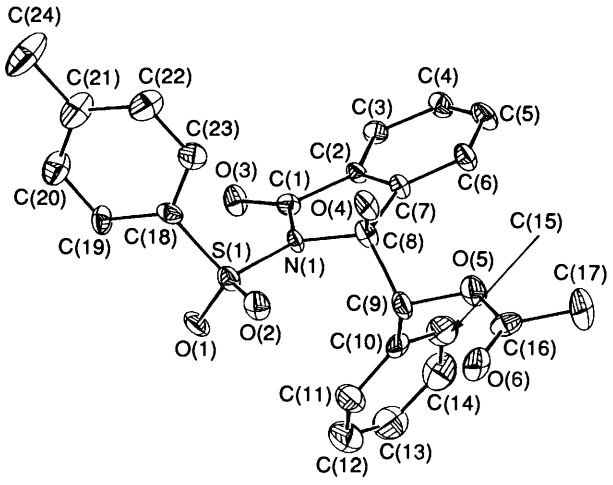


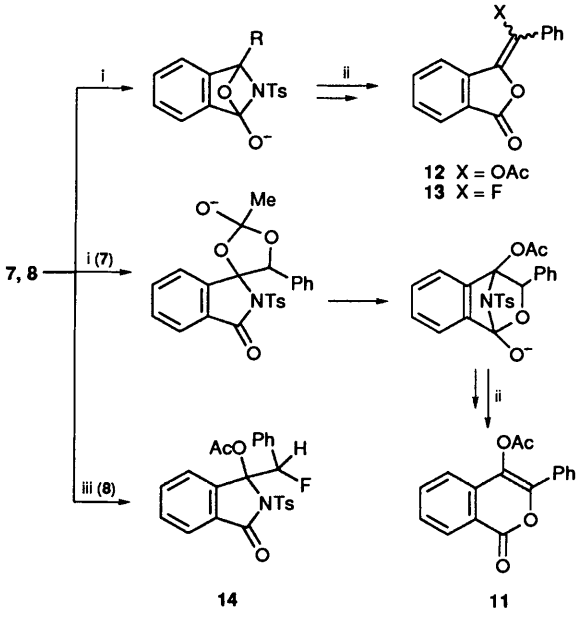
Fig. 1 X-Ray structure of one enantiomer of the (*S*, *R*; *R*, *S*)-hydroxyisoindolone **7** showing the numbering scheme used

The diazo compound **6b**, like its methyl analogue **6a**, slowly decomposed in aqueous solution to furnish, after 3 days, the dione **4b** (50%) (Scheme 2). In contrast, little (20%) of product **4b** was produced when compound **6b** was treated in acetic acid. In this case, the major product was the hydroxyisoindolone **7** (75%) isolated as a mixture of two diastereoisomers in 3:1 ratio (Scheme 2). The structure of compound to **7** (and its diastereoisomeric ratio) was established on the basis of ^1H and ^{13}C NMR, IR and mass spectral evidence. In particular, the mass spectrum showed no molecular ion, but there was a predominant fragmentation ion at *m/z* 302 (M^+ − PhCHOAc). Moreover, fractional crystallization gave a crystal suitable for X-ray analysis (Fig. 1); this showed that the product was the pure (*S*, *R*; *R*, *S*)-**7** diastereoisomer.

Upon reaction with triethylamine in benzene at 80 °C compound **7** furnished, besides tosyl amide (84%), the pyranone **11** (40%) and the isomeric isobenzofuranone **12** (40%); a possible route to these products is outlined in Scheme 3.

Finally, compound **6b** reacted in dichloromethane in the presence of BF_3·OEt_2 to give mainly the hydroxyisoindolone **8** as a 1:1.5 diastereoisomeric mixture (Scheme 2). Its structure was assigned by spectral and chemical analogy with the isoindolone **7** congener. Upon reaction with triethylamine in boiling benzene, compound **8** was cleanly converted into the isobenzofuran **13** and toxyl amide (Scheme 3). Moreover, upon treatment with acetyl chloride in pyridine it gave the corresponding acetate **14** (Scheme 3). Interestingly, the acetate **14** was obtained as a single diastereoisomer (of unknown configuration), thereby indicating that under the reaction conditions the two isoindolone **8** diastereoisomers equilibrated through ring opening–ring closure of the heterocyclic moiety.

The decomposition of the diazo keto amides **3a**, **b** and their triethylamine salts **6a**, **b** can be generally regarded as being acid-promoted. As appropriate, the acid promoter was the *N*-tosylcarbamoyl substituent itself in the case of **3a**, **b** and the triethylammonium counterion, acetic acid or boron trifluoride in the cases of **6a**, **b**. A possible mechanistic interpretation of our findings is outlined in Scheme 4. Protonation (or complexation with BF_3) of the diazo carbons and the carbonyl oxygens of **3a**, **b**/**6a**, **b** affords diazonium ion intermediates **15a**, **b** and/or **16a**, **b**, respectively. The resulting carbon-protonated intermediate **15a** would give the isoquinoline **5a** through nucleophilic displacement of nitrogen by the adjacent nitrogen substituent. The corresponding diazonium enolate intermediate **16a** would instead afford the isoquinoline **4a** through (concerted) nitrogen loss and a 1,2-aryl shift followed by intramolecular cyclization of the ensuing ketene. On the other hand, the diazonium enolate ion **16b** might be totally responsible for the decomposition products of **3b** and its salt **6b**. The ion **16b** would give the resonance-stabilized vinyl cation **17** by loss of nitrogen. The cation **17**, according to the reaction conditions, would undergo two kinds of reactions: (i) 1,2-aryl migration leading to the isoquinolinedione **4b** and/or (ii) nucleophilic trapping by fluoride ion (from internal fluoroborate ion) and acetate counterion to give the intermediate keto amides **18** and thence the hydroxyisoindolone products **7** and **8**. The above postulated reaction pathways are essentially based on the following assumptions: (i) carbon and, especially, oxygen are the most likely sites for protonation (and complexation by a Lewis acid) of α-diazocarbonyl compounds, as suggested by previous chemical, spectral and theoretical evidence;[4,5] (ii) *O*-protonation and *O*-complexation with BF_3 is more favoured for the phenyl-substituted analogue **3a**/**6a**; and (iii) *O*-protonation (and *O*-complexation with BF_3) is primarily responsible for the observed Wolff-type rearrangement products **4a**, **b**; this is in agreement with previous assumptions put forward for related acid-promoted rearrangements of diazo ketones.



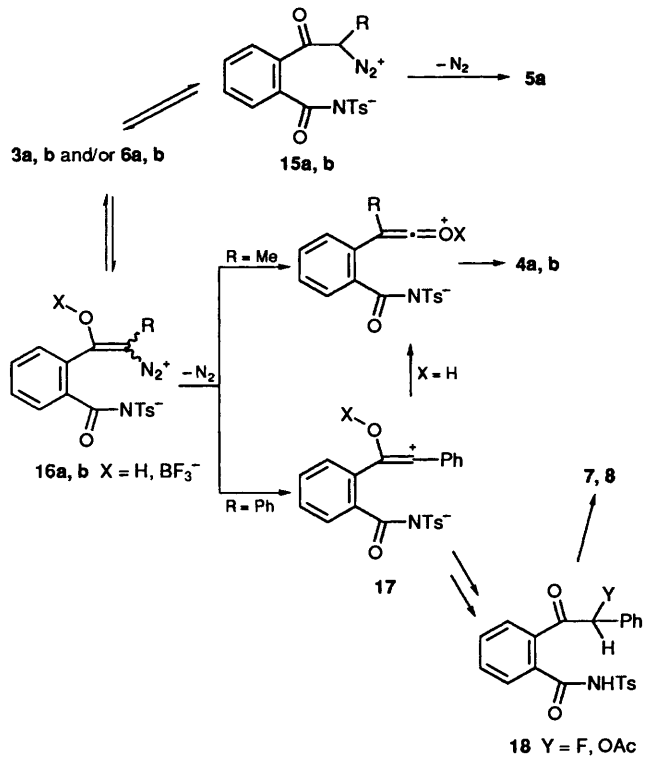
Scheme 3 *Reagents and conditions:* i, benzene, Et_3N, 80 °C; ii, $+H^+$, $-TsNH_2$; iii, AcCl, pyridine, 25 °C

However, we do not exclude the possibility that carbene (or carbenoid) rather than ionic routes might be involved in the formation of the rearranged products **4a**, **b**. Indeed, as previously pointed out by other authors,[4] a clear separation between a carbenium ion mechanism and a carbenoid mechanism can hardly be made for acid-promoted Wolff rearrangements of α-diazocarbonyl compounds.

We also investigated the rhodium(II) acetate-catalysed decomposition of our diazoacetophenones **6a**, **b**. This catalyst was expected to convert diazocarbonyl compounds **6a**, **b** into highly electrophilic metallo-carbenoid species[6] which might be readily intercepted by the adjacent nitrogen substituent to afford the isoquinoline-1,4-diones **5a**, **b**.

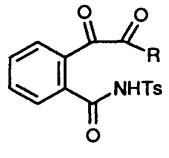
Upon reaction in benzene at room temperature, in the presence of catalytic amounts of $Rh_2(OAc)_4$, the diazo compound **6a** furnished the expected 1,4-dione **5a** in modest yield (28%) and the hydroxyisoindolone **9** in fairly high yield (69%) (Scheme 1).

Comparable results were obtained from the analogous reaction of the diazoacetophenone **6b** which gave the 1,4-dione **5b** (as its enol tautomer **5'b**) and the hydroxyisoindolone **10** in



Scheme 4

43 and 38% yield, respectively. Formation of the isoindolones **9** and **10** might be ascribed to the intermediacy of the α-diones **19** (R = Me, Ph) which, in turn, might derive from reaction of corresponding metallo-carbenoid intermediates with dioxygen. Actually, when the diazoacetophenone **6b** reacted in the presence of $Rh_2(OAc)_4$ under an atmosphere of nitrogen, we observed a significant decrease in the yield of the isoindolone **10** in favour of the ring-expanded isoquinoline **5b**. Nevertheless, the mechanism leading to compounds **9** and **10** remains obscure; to our knowledge, significant occurrence of α-dione products from analogously catalysed decompositions of α-diazo ketones is quite unusual.[6]



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In conclusion, our present and previous work shows that the diazo transfer reaction of tosyl azide with 2-substituted indanediones can offer a straightforward route to *ortho-N*-tosylcarbamoyl-substituted α-diazoacetophenones which are (very) unstable and hardly isolable products. Their peculiar instability is ascribable to the fairly high acidity of the *N*-tosylcarbamoyl substituent which can bring about acid-catalysed decomposition of the diazo function. Their triethylamine salts can instead be isolated as stable solid compounds which can be dissolved both in water and organic solvents. These diazoacetophenones represent attractive synthetic precursors of *N*-tosyl-substituted isoquinolinediones and hydroxyisoindolones which, in turn, are convenient precursors of isobenzofuranones.

Experimental

Tosyl azide **1**[7] and 2-methylindane-1,3-dione **2a**[8] were prepared according to literature methods. 2-Phenylindanedione **2b** was commercially available. Known reaction products such as the isoquinoline-1,3-diones **4a**, **b**[2] and the isoquinoline-1,3-dione **5a**[2] were identified by spectral comparison with authentic specimens. All m.p.s (Kofler melting points apparatus) are uncorrected. ^1H and ^{13}C NMR spectra were performed in $CDCl_3$ (unless otherwise stated) with Me_4Si as internal standard and recorded on a Varian Gemini 200 (200 MHz) spectrometer. IR spectra were performed in $CHCl_3$ and recorded on a Perkin-Elmer 257 spectrometer. MS spectra were determined by the electron impact method (70 eV) on a VG 7070 instrument. Column chromatography was carried out on ICN silica gel 63-200 60A, by gradual elution with light petroleum (b.p. 40–70 °C)–diethyl ether mixtures and final elution with dichloromethane.

Synthesis of the Diazo Keto Amide **3a** *as the Triethylamine Salt* **6a**.—A stirred solution of the indanedione **2a** (5 mmol) and tosyl azide (5 mmol) in diethyl ether (25 cm^3) was treated with Et_3N (5 mmol) at room temperature. After a few hours a pale-yellow precipitate was formed. This was filtered off and washed several times with diethyl ether to give the title diazo salt **6a** (3.85 mmol, 77%), m.p. 85–86 °C (decomp.); ν_{max}/cm^{-1} 3485 br, 2078 (C=N_2), 1600 (C=O) and 1550 (C=O); δ_H 1.2 (9 H, t, *J* 7), 1.5 (1.1 H, br s) and 1.9 (1.9 H, br s) [two different kinds of diazo methyl groups owing to hindered rotation about the C(O)–C(N_2) bond], 2.39 (3 H, s), 3.11 (6 H, q, *J* 7), 7.2–8.3 (8 H, m) and 8.59 (1 H, s) (Found: C, 59.8; H, 6.55; N, 12.1; S, 7.1. $C_{23}H_{30}N_4O_4S$ requires C, 60.2; H, 6.6; N, 12.2; S, 7.0%).

Synthesis of the Diazo Keto Amide **3b** *as the Triethylamine Salt* **6b**.—A solution of 2-phenylindanedione **2b** (5 mmol) and tosyl azide **1** (15 mmol) in 15 cm^3 of THF was treated with Et_3N (5 mmol) and then stirred at room temperature for *ca.* 20 h. After this time, diethyl ether (150 cm^3) was added to the yellow–orange reaction mixture to give a pale-yellow solid. This was filtered off and shown to be the title diazo salt **6b** (3.9 mmol, 78%), m.p. 100–102 °C (decomp.); ν_{max}/cm^{-1} 3450br, 2080 (C=N_2), 1620 (C=O) and 1600 (C=O); δ_H 1.05 (9 H, t, *J* 7), 2.37 (3 H, s), 3.0 (6 H, q, *J* 7) and 7.15–8.4 (14 H, m); δ_C 8.50 (q), 21.45 (q), 46.05 (t), 73.95 (s), 171.95 (s), 191.2 (s) and aromatic C (Found: C, 64.4; H, 6.15; N, 10.7; S, 6.1. $C_{28}H_{32}N_4O_4S$ requires C, 64.6; H, 6.2; N, 10.75; 6.15%).

Decomposition of the Diazo Salts **6a**, **b** *in Benzene*.—A solution of the diazo salt **6a** (0.22 mmol) in dry benzene (5 cm^3) was heated at 95 °C in a sealed tube for *ca.* 1 h. The excess of solvent was evaporated and the resulting residue chromatographed to give a mixture of the isoquinolinediones **4a** and **5a** (0.14 mmol, 65%) in 45:55 ratio, as shown by ^1H NMR spectroscopy.

Similar reaction of the diazo salt **6b** (1.0 mmol) in dry benzene (25 cm^3) for 20 min gave, after column chromatography, the isoquinoline **4b** (0.75 mmol, 75%).

Decomposition of the Diazo Salts **6a**, **b** *in Water*.—A solution of the diazo salt **6a** (0.50 mmol) in water (10 cm^3) was stirred at room temperature for 10 days, after which the reaction mixture was extracted with diethyl ether. The organic layer was separated and evaporated to give a residue which was chromatographed to furnish (i) the isoquinolinedione **4a** (0.15 mmol, 30%) and (ii) tosyl amide (0.10 mmol, 20%).

Analogous reaction of the diazo salt **6b** (1.0 mmol) in water (100 cm^3) for 3 days gave the isoquinoline **4b** (0.50 mmol, 50%) after column chromatography.

Decomposition of the Diazo Salts **6a**, **b** *in Acetic Acid*.—A solution of the diazo salt **6a** (1.0 mmol) in 1 cm^3 of acetic acid

was stirred at room temperature for 5 min. The solid which had separated was collected and washed with diethyl ether to furnish the dione **4a** (0.60 mmol, 60%). The organic mother liquor was evaporated and the residue chromatographed to give a further quantity of the dione **4a** (0.20 mmol, 20%). Analogous reaction of the diazo salt **6b** (1.0 mmol) in acetic acid (1 cm^3) furnished a precipitate which was filtered off and afforded the 3-(α-*acetoxybenzyl*)-2,3-*dihydro*-3-*hydroxy*-2-*tosylisoindol*-1-*one* **7** (0.35 mmol, 35%) as a mixture of two diastereoisomers. The residue from evaporation of the organic filtrate was chromatographed to give, besides the dione **4b** (0.20 mmol, 20%), a further quantity of the isoindolone **7** (0.40 mmol, 40%) as a similar diastereoisomeric mixture.

The two isolated mixtures of the isoindolone **7** diastereoisomers were combined and analysed: ν_{max}/cm^{-1} 3510 (OH) and 1755br; *m/z* 302 (M^+ − PhCHOAc, 100%), 238, 155, 148, 130, 105, 91 and 43; δ_H 2.37 (3 H, s), 2.39 (2.25 H, s), 2.41 (0.75 H, s), 5.17 (0.75 H, s, OH), 5.19 (0.25 H, s, OH) and 6.5–8.1 (14 H, m) (diastereoisomeric ratio 3 : 1); δ_C(DMSO) 20.7 (q), 21.1 (q), 21.3 (q), 76.0 (d), 77.7 (d), 95.9 (s), 96.8 (s), 164.9 (s), 168.9 (s), 169.5 (s) and aromatic C (Found: C, 64.0; H, 4.75; N, 3.1; S, 7.2. $C_{24}H_{21}NO_6S$ requires C, 63.85; H, 4.7; N, 3.1; S, 7.1%). Fractional recrystallization from benzene of a sample of the above isoindolone **7** mixture allowed the separation of a few crystals of the pure (*S,R*;*R,S*)-diastereoisomer, m.p. 181–182 °C, whose structure was unambigously established by crystallographic analysis (*vide infra*).

The diastereoisomeric mixture of the isoindolone **7** (0.5 mmol) was treated with Et_3N (1.0 mmol) in boiling benzene (5 cm^3) for 15 h, after which the resulting mixture was washed with water (30 cm^3) and then evaporated. Chromatography of the residue gave (i) the isobenzopyranone **11** (0.09 mmol, 18%), m.p. 118–119 °C (lit.,[9] m.p. 119 °C), identical in all respects with an authentic sample independently prepared;[9] ν_{max}/cm^{-1} 1770 (C=O) and 1740 (C=O); δ_H 2.3 (3 H, s) and 7.3–8.3 (9 H, m); *m/z* 280 (M^+), 238 (100%), 210, 209, 181, 132, 105, 104 and 43 (its structure was fully confirmed by an X-ray crystal structure determination whose details will be reported elsewhere); (ii) an unresolved 1 : 1 mixture of the pyranone **11** and the isomeric isobenzofuranone **12** (0.22 mmol, 44% overall yield); (iii) the furanone **12** (0.09 mmol, 18%), m.p. 130–132 °C (lit.,[9] m.p. 134 °C), identical in all respects with an authentic sample independently prepared;[9] ν_{max}/cm^{-1} 1780 (C=O) and 1750 (C=O); δ_H 2.5 (3 H, s) and 7.3–8.0 (9 H, m); *m/z* 280 (M^+), 238 (100%), 210, 209, 181, 132, 105 and 43; and (iv) tosyl amide (0.09 mmol, 18%). An additional crop of tosyl amide (0.33 mmol, 66%) was obtained by acidification of the aqueous washing layer and subsequent extraction with diethyl ether.

Decomposition of the Diazo Salts **6a**, **b** *in the Presence of* BF_3.—A solution of the diazo salt **6a** (1 mmol) in dichloromethane (5 cm^3) was treated with boron trifluoride–diethyl ether complex (47% BF_3: 4 mmol) and the mixture was stirred at room temperature for 2 h. The excess of solvent was removed and the residue chromatographed to give (i) the isoquinolinedione **4a** (0.38 mmol, 38%) and (ii) a mixture of unidentified products (200 mg).

The diazo salt **6b** (1 mmol) was similarly treated with $BF_3{\cdot}OEt_2$ for 0.5 h. The resulting reaction mixture was washed several times with 20% aqueous sodium carbonate as well as water. The combined aqueous washings were acidified with hydrochloric acid and then extracted with diethyl ether. Evaporation of the separated organic layer left a solid residue which was shown to be a 1 : 1.5 mixture of two diastereoisomers of 3-(α-*fluorobenzyl*)-2,3-*dihydro*-3-*hydroxy*-2-*tosylisoindol*-1-*one* **8** (0.76 mmol, 76%); ν_{max}/cm^{-1} 3525sh (free OH), 3420br (hydrogen bonded OH) and 1745 (C=O); δ_H 2.4 (1.8 H, s), 2.44 (1.2 H, s), 4.75 (0.6 H, br s), 4.95 (0.4 H, br s), 6.35 (0.4 H, d, *J* 44.5), 6.40 (0.6 H, d, *J* 44.5), 6.95–7.85 (11 H, m), 7.90 (1.2 H, d, *J* 9) and 7.97 (0.8 H, d, *J* 9); *m/z* 302 (M^+ − PhCHF), 240 (100%), 236, 183, 130, 105, 104 and 91 (Found: C, 64.35, H, 4.45; F, 4.6; N, 3.4; S, 7.85. $C_{22}H_{18}FNO_4S$ requires C, 64.2; H, 4.4; F, 4.6; N, 3.4; S, 7.8%). The above isoindolone **8** mixture (0.15 mmol) was treated with Et_3N (0.3 mmol) in boiling benzene (5 cm^3) for 24 h. Removal of the excess of solvent and subsequent chromatography of the residue gave (i) the *isobenzofuranone* **13** (0.13 mmol, 87%), m.p. 106–108 °C; ν_{max}/cm^{-1} 1780 (C=O); δ_H 7.4–8.1 (complex multiplet of ArH) (Found: M^+, 240.05828. $C_{15}H_9FO_2$ requires *M*, 240.05866); *m/z* 212, 211 and 183; and (ii) tosyl amide (0.12 mmol, 78%). The above isoindolone **8** mixture (0.6 mmol) was also treated with acetyl chloride (0.9 mmol) in pyridine (2 cm^3) at room temperature for 2 h. The reaction mixture was added to water, and extracted with diethyl ether. Work-up of the extract followed by chromatography furnished, as a single diastereoisomer, 3-*acetoxy*-3-(α-*fluorobenzyl*)-2,3-*dihydro*-2-*tosylisoindol*-1-*one* **14** (0.45 mmol, 75%), m.p. 144–145 °C; ν_{max}/cm^{-1} 1777 (C=O) and 1753 (C=O); *m/z* 344 (M^+ − PhCHF), 302 (100%), 238, 155, 130, 109 and 43; δ_H 2.1 (3 H, s), 2.40 (3 H, s), 6.05 (1 H, d, *J* 6.7), 6.85 (1 H, d, *J* 44.5), 7.25–7.55 (9 H, m), 7.8 (1 H, d, *J* 6.7) and 8.15 (2 H, d, *J* 9); δ_C(DMSO) 21.4 (q), 90.6 (dd), 93.9 (d), 165.1 (s), 167.6 (s) and aromatic C (Found: C, 63.5; H, 4.5; F, 4.2; N, 3.1; S, 7.05. $C_{24}H_{20}FNO_5S$ requires C, 63.6; H, 4.45; F, 4.2; N, 3.1; S, 7.1%).

Rhodium(II) *Acetate-catalysed Decomposition of the Diazo Salts* **6a**, **b**.—To a solution of the diazo salt **6a** (0.44 mmol) in benzene (3 cm^3) was added a catalytic quantity of $Rh_2(OAc)_4$ and the mixture was stirred at room temperature for 90 min. Evaporation of the benzene solvent and subsequent chromatography of the residue gave (i) the isoquinoline-1,4-dione **5a** (0.12 mmol, 28%) and (ii) 3-*acetyl*-2,3-*dihydro*-3-*hydroxy*-2-*tosylisoindol*-1-*one* **9** (0.30 mmol, 69%), m.p. 128–129 °C; ν_{max}/cm^{-1} 3450 (OH), 1750 (C=O) and 1730 (C=O); *m/z* 302 (M^+ − MeCO, 100%), 155, 139, 91 and 42; δ_H 2.28 (3 H, s), 2.44 (3 H, s), 5.74 (1 H, s) and 7.3–8.2 (8 H, m); δ_C 21.7 (q), 22.6 (q), 93.1 (s), 165.7 (s), 201.7 (s) and aromatic C (Found: 59.1; H, 4.35; N, 4.0; S, 9.2. $C_{17}H_{15}NO_5S$ requires C, 59.1; H, 4.4; N, 4.05; S, 9.3%).

Analogous reaction of the diazo salt **6b** (0.96 mmol) for 20 h furnished, after column chromatography, (i) 3-*benzoyl*-2,3-*dihydro*-3-*hydroxy*-2-*tosylisoindol*-1-*one* **10** (0.36 mmol, 38%), m.p. 159–160 °C; ν_{max}/cm^{-1} 3567 (free OH), 3410 br (hydrogen bonded OH), 1747 (C=O) and 1688 (C=O); δ_H 2.34 (3 H, s), 6.31 (1 H, s) and 7.1–7.95 (13 H, m); δ_C 21.85 (q), 92.05 (s), 165.95 (s), 194 (s) and aromatic C (Found: M^+, 407.08394. $C_{22}H_{17}NO_5S$ requires *M*, 407.08274); *m/z* 390, 302 (M^+ − PhCO, 100%), 155, 130, 105 and 91; (ii) tosyl amide (0.12 mmol, 12%) and (iii) 4-*hydroxy*-3-*phenyl*-2-*tosylisoquinolin*-1-*one* **5'b** (0.41 mmol, 43%), m.p. 182–184 °C (decomp.); ν_{max}/cm^{-1} 3384br (OH) and 1745 (C=O); δ_H 2.37 (3 H, s) and 6.05–8.05 (13 H, m); δ_C 21.8 (q), 92.55 (s), 158.85 (s) and 165.4 (s) (Found: M^+, 391.08943. $C_{22}H_{17}NO_4S$ requires *M*, 391.08783); *m/z* 327, 236, 194, 165, 155, 132, 130 and 104. The same reaction of the diazo salt **6b**, when repeated under an atmosphere of nitrogen, gave (i) the isoindolone **10** (14%) and (ii) the isoquinolinone **5'b** (74%).

X-Ray Crystal Structure Analysis of the (S,R;R,S)-*Diastereoisomer of the Hydroxyisoindolone* **7**.—*Crystal data*. $C_{24}H_{21}SO_6N{\cdot}C_6H_6$, *M* = 529.6. Orthorhombic, *a* = 10.176(3), *b* = 17.292(5), *c* = 30.732(6) Å, *V* = 5407.7 $Å^3$ (by least-squares fitting of the goniometric angles of 24 automatically centred reflections, λ = 0.7107 Å) space group *Pbca*, *Z* = 8, D_x = 1.301 g cm^{-3}, colourless prismatic crystals, μ(Mo-Kα) = 1.55 cm^{-1}, F_{000} = 2224.

Data collection and processing. Philips PW1100 diffractometer, θ–2θ scan, scan width 1.2 + 0.34 tg θ, scan speed 0.05–0.16° s^{-1}, graphite-monochromated Mo-Kα radiation. 8298 measured reflections (3° < θ < 23°, h, k, $\pm l$). 2855 observed ($I > 3\sigma(I)$) reflections, merged to 1545 unique (merging R = 0.023) reflections utilized in the structure analysis.

Structure analysis and refinement. The structure was solved by direct methods and refined anisotropically by full-matrix least-squares using a SHELX76[10] version included in the CRYSRULER[11] package. Molecules of the crystallization solvent (benzene) were found, by Fourier syntheses, to be trapped in the crystal lattice in 1 : 1 ratio with 7. H atoms were located by difference Fourier maps but not refined. Final agreement factors were $R = 0.062$, $R_w = 0.054$ ($w = 1/(\sigma^2(F_o) + 0.000319\ F_o^2)$), with $\sigma(F_o)$ from counting statistic, S = 1.81 for 344 parameters and 1545 reflections ($N_O/N_V = 4.49$). Maximum $\Delta/\sigma = 0.018$ (0.1 for the solvent molecule) and maximum and minimum residual peaks in the final difference Fourier map 0.46 and −0.44 eÅ^3. The crystal structure consists of a racemic arrangement of the (*S*,*R*; *R*.*S*) enantiomeric pair. Fig. 1 shows the molecular structure of one enantiomer (the second one is related by the centre of symmetry) with the utilized numbering scheme. Analysis of the molecular packing showed that the arrangement of the diastereoisomer molecules origins channels which are filled with molecules of the crystallization solvent. This points out the important role of benzene in the crystallization process which allows, as a result of hindrance, the selective crystallization of the studied diastereoisomer. Listings of atomic coordinates, bond lengths and bond angles, and thermal parameters have been deposited at the Cambridge Crystallographic Data Centre.

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